ENGINEERING NEWS-RECORD

JUNE 15, 1944

CONSTRUCTION IN THE PACIFIC

N. A. Bowers, war correspondent for Engineering News-Record, begins his story of three months' observation on our island outposts.

In This Issue: BRITAIN LOOKS BEYOND THE BATTLE

ANOTHER

ARTESIAN WELL

FOR STURGEON BAY, WISCONSIN

ANOTHER

CASING JOB FOR . . .

Byers Wrought Iron

When war industries boomed the population of Sturgeon Bay, Wisconsin, by 160%, expanding the water supply became an acute problem. Two new artesian wells were sunk, but since they had to be pumped 24 hours a day to take care of normal needs, no reserve water was available. A third well has recently been drilled, that has a natural artesian flow of 500,000 gallons in 24 hours, and yields over a million gallons a day on the pump.

An outside casing of 20-inch Byers Wrought Iron pipe was sunk through the 76-feet of surface gravel, and a 12-inch Byers Wrought Iron insert was carried from surface to 104 feet. The space between was filled with sand and cement. The well was bottomed at 313 feet.

Mr. Rufus Mather Bagg was the geological engineer on this project and drilling was done by Joseph Egerers. Jess B. Johnson was the Superintendent of Public Utilities. The same group was in charge of the development of the previous well, also cased with Byers Wrought Iron.

Casing is so important to a safe and sustained water supply, and its cost makes up such a small part of the total cost of a well, that nothing but the best should be considered. Experience provides a wealth of proof that wrought iron is particularly durable and dependable in this service. Service records covering periods up to half a century are not unusual . . . and in many cases these records have been made in localities where ordinary materials failed in a fraction of that time.

The ability of wrought iron to resist corrosion from both water and soil comes from its unique structure. Countless tiny fibers of glass-like silica slag, are threaded through the body of high-purity iron. These fibers make up only two or three per cent of the material by weight . . . but they play a very large part in combating corrosion. They resist and disperse any attack, discouraging the local pitting that causes speedy failure of ordinary materials. And they also anchor the initial protective film which helps to shield the underlying metal.

Because of the importance of a durable well casing, wrought iron can be obtained even for private wells. We have prepared a special report on wrought iron in well casing service, and if you have any drilling in prospect, we will gladly arrange to let you see a copy. Just write.

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ELECTRIC FURNACE ALLOY STEELS · OPEN HEARTH ALLOY STEELS
CARBON STEEL TUBULAR PRODUCTS

CONSTRUCTION TRENDS

Notes on significant movements in the construction industry

Postwar Earthwork and Unclassified Construction

EARTHWORK AND DRAINAGE, and unclassified projects proposed for postwar construction from January, 1943 through April, 1944 total $3,234,109,000—$2,029,438,000 for earthwork and drainage, and $1,204,671,000 for unclassified construction. Combined, these two classes of work account for 40 percent of the $8,028,114,000 reported for postwar construction, with earthwork and drainage responsible for 25 percent and unclassified for 15 percent.

Of the proposed earthwork and drainage volume, $215,515,000, or 10.5 percent, has plans underway or completed. These projects in the planning stage amount to 9.3 percent of the total of $2,306,552,000 for projects with plans underway or completed in the period.

Comparison of the proposed earthwork and drainage volume with *ENR* budget estimates for annual postwar volume in this class of work shows the sixteen-month proposed total 306 percent above the maximum annual budget estimate. Planning stage volume, however, is 28 percent below the minimum postwar budget of $300,000,000, and 57 percent below the maximum budget, $500,000,000.

Unclassified construction projects in the planning stage total $301,340,000 and make up 25 percent of the proposed unclassified volume for the period since January, 1943.

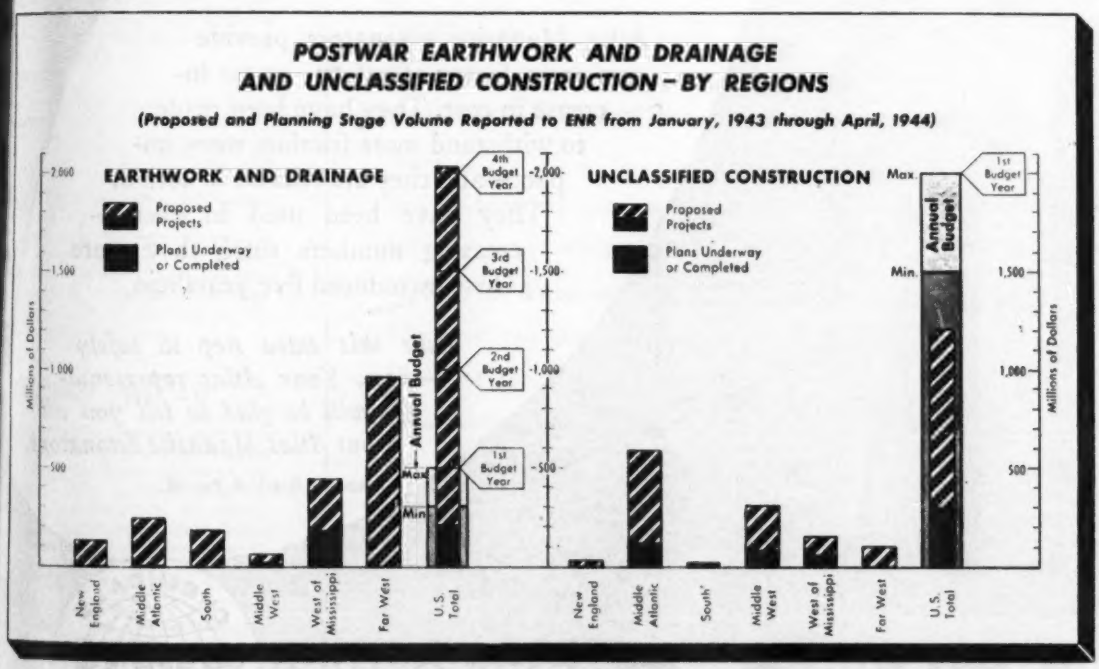
Proposed unclassified volume, $1,204,671,000, is 20 percent below the minimum annual budget of $1,500,000,000, and is 40 percent under the maximum budget of $2,000,000,000. Unclassified projects with plans underway or completed are 80 percent under the minimum annual budget, and 85 percent under the maximum.

Far West, with a proposed earthwork and drainage volume of $953,309,000, leads all other sections, but only 2.7 percent of the volume has reached the planning stage. West of the Mississippi heads the planners with $182,360,000 in this stage, 41 percent of its second-place proposed postwar volume.

With a proposed unclassified construction volume of $587,376,000, Middle Atlantic states top all regions, and with $124,572,000, or 21 percent of the prosposed unclassified total with plans underway or completed, also lead all sections in this stage of postwar planning.

POSTWAR EARTHWORK AND DRAINAGE AND UNCLASSIFIED CONSTRUCTION—BY REGIONS

(Proposed and Planning Stage Volume Reported to ENR from January, 1943 through April, 1944)



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ATLAS MANASITE DETONATORS

Have You Taken This Step to EXTRA SAFETY?

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132 June 15, 1944 No. 24

MING NEXT

ABEES SPEED CONSTRUCTION IN PACIFIC, scheduled for the June ue, is the first of a series of cal articles to be published on eering and construction meth- sed in building our island . In this article, N. A. Bowers, 's Pacific Coast Editor, reviews istory of the Navy's Construc- Battalions, outlines their plan eration and tells how they are heavy equipment to set a new in construction speed records r far flung Pacific bases. Mr. rs has just returned to the after a 28,000 mile inspection overing 29 advance bases.

o featured in the June 29 issue e an article on war construc- in the Aleutian Islands. H. W. rdson, *ENR*'s Western Editor, of new techniques being used ilding roads over the tundra ed and peat-like bogs, 2 to 10 eep, on these barren, wind- islands. Two general methods oyed in overcoming the problem e described.

e most interesting and finan- sound postwar slum clearance yet developed has been orig- d by a Texas highway and ling contractor. The scheme aces the elimination of 600 acres ubstandard dwellings and re- ment with modern, comfortable es, all at a cost that the original lents can afford to pay—No pub- ubsidy is required. The com- plan will be outlined in de- in the June 29 issue.

OKING AHEAD

hen Grand Coulee Dam was g designed it was recognized that e would be some erosion in the way bucket in dissipating the ons of horsepower of energy would be developed there during ls. Recent inspections have re- ed the extent of the erosion. An le in the July 13 issue will tell re erosion was found and will ine plans for maintaining the et in future years.

simplified method of designing d frame concrete bridges with ed soffit decks will be published n early issue. The use of this hod permits rapid and accurate ign.

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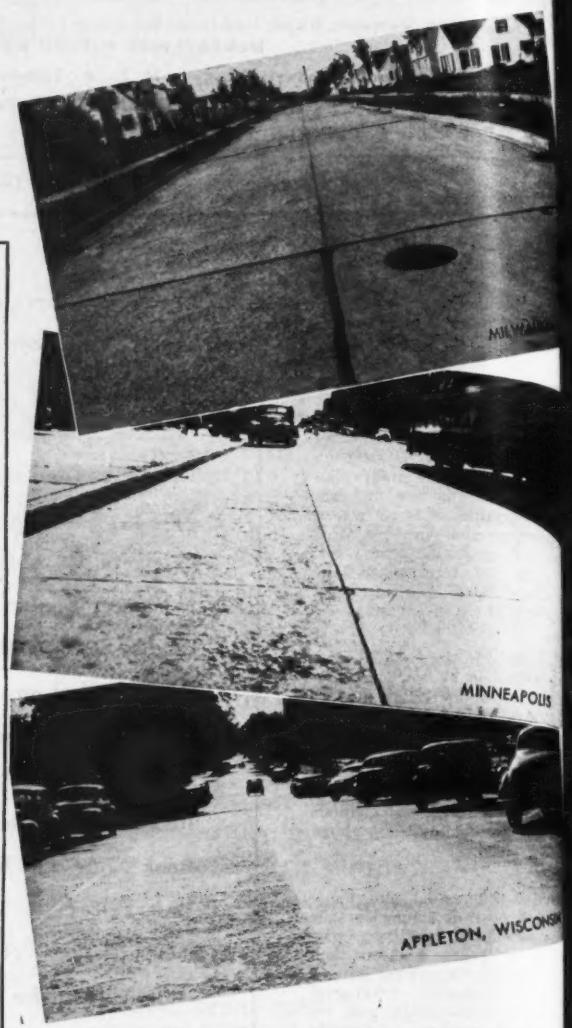

In each of the installations pictured above, Atlas Duraplastic was used on the right lane; normal cement was used on the left lane. Note that in each case the left lane has scaled, but the right lane is practically scale-free after several winters of identical salt de-icing treatment.

MORE than three score paving installations in over a dozen states and cities have proved the advantages of this new cement. Its commercial announcement in 1943 followed more than five years of research and testing in the laboratory, in the manufacture of this cement, and on actual jobs. Some of these have now passed their fifth winter of salt de-icing applications and all are practically scale-free.

For further information on the use of Atlas Duraplastic, write to our Technical Service Bureau. Ask for reprints of articles from technical journals giving details of actual installations. Universal Atlas Cement Company (United States Steel Corporation Subsidiary), Chrysler Bldg., New York 17, N. Y.

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ATLAS DURAPLASTIC CEMENT
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The Week In Engineering and Construction

GINEERING NEWS-RECORD • JUNE 15, 1944 • VOLUME 132 • NUMBER 24

Stream pollution abatement with federal aid proposed

House Rivers and Harbors Committee considers a bill authorizing $50 million a year for grants-in-aid and loans to states for this purpose

he House Rivers and Harbors Com-ee has under consideration a bill ntly introduced in Congress to ide federal funds for postwar aid tates, territories, and industrial con-s for the abatement of stream pol-n. A similar bill was passed by gress six years ago, but was vetoed he President.

he bill, H. R. 4741, places responsi-y for construction of treatment s upon the sanitary engineering ion of the United States Public lth Service in the Office of the Sur-General, and sets up a water pol-n control advisory board to review policies of the Public Health Serv-in connection with the proposed ram, and to make recommenda-s to the Surgeon General.

he measure authorizes appropria-of $50,000,000 a year for federal nts-in-aid and loans to the states for truction of treatment works; an itional $500,000 a year for admin-tive, travel, and similar expenses; $1,500,000 a year to be allotted to states for surveys and engineering orts.

Monies appropriated would remain lable for two years, and allotments tates would be made in accordance h regulations prescribed by the eral Security Agency administrator.

Five new sanitary engineers

t creates jobs for five additional itary engineer officers for general ice in the Public Health Service, authorizes hiring additional engi-s and consultants.

he advisory board would be com-d of the following officers, or offi-s designated by them: The Surgeon eral, to serve as chairman; the chief he Corps of Engineers; director of U. S. Fish and Wildlife Service; two non-government persons to be appointed annually by the Surgeon General. Of the latter, one would be a sewage and industrial waste disposal man, and the other a wildlife conservationist, both to be paid $25 a day, plus travel and subsistance allowances.

The sanitary engineering division, in cooperation with the Corps of Engineers and with other government agencies, would make comprehensive plans for eliminating stream pollution, and would promote use of streams for public water supplies, fish propagation and for recreational, agricultural and industrial purposes. Investigations could be made on any stream in the United States, the territories, and possessions.

Uniform state laws

The division would also encourage cooperative activities by, and compacts between, the states, and the enactment of uniform state laws. The Surgeon General would notify the responsible agency of any pollution found to be excessive, would make recommendations for remedial measures, and specify a time limit for establishing abatement.

Federal aid to states includes grants-in-aid in amounts up to 50 percent of the cost of labor and materials, and loans bearing interest at rates to be prescribed by the President. Loans could also be made to private corporations for ten years. The division would estimate costs, and establish priorities based on the importance of proposed projects. The Surgeon General would utilize some federal agency designated by the President to review plans and to award contracts.

Press Ass'n photo

Engineer officers dine alfresco in Pacific area

Pictured above are ranking members of the Engineer Corps partaking of an impromptu meal in an open field somewhere on the Pacific front. From left to right: Col. David L. Neuman, Col. Gerard B. Troland, Maj. Gen. Hugh Casey, Col. Leif J. Sverdrup and Lt. Col. Dwight C. Butz. General Casey is General MacArthur's chief engineer. Colonel Sverdrup was recently nominated by the President to be brigadier general.

Bureau of Reclamation's program will greatly benefit Northwest

Of the bureau's postwar expenditure of $3 billion, Washington, Oregon and Idaho would get $579 million for 36 multiple-purpose and irrigation projects, provided people of area approve

Development of 36 multiple-purpose and irrigation projects at a cost of $579,000,000 is envisioned by residents of Washington, Oregon and Idaho as a consequence of Interior Secretary Harold L. Ickes' recent transmission to the Senate Committee on Post-War Economic Planning Policy of a proposed $3,000,000,000 postwar public works program of the Bureau of Reclamation.

Mr. Ickes' overall program inventoried 236 potential projects which he recommended as a means of providing postwar employment and of encouraging settlement on irrigated land of returning service men and demobilized industrial workers.

Frank A. Banks, regional director of Reclamation, said at Coulee Dam, Wash., that the development listed in the three states of the Pacific northwest would bring under irrigation 1,688,000 acres of new land, provide a supplemental water supply for 1,709,260 acres now facing shortages, make available 922,000 kw. of additional power on authorized projects, and 765,000 kw. of firm power on projects under study. In addition, program would provide flood control and river regulation benefits.

Mr. Banks stated that 1,251,000 men would be required to build all the projects and provide the necessary construction materials and supplies.

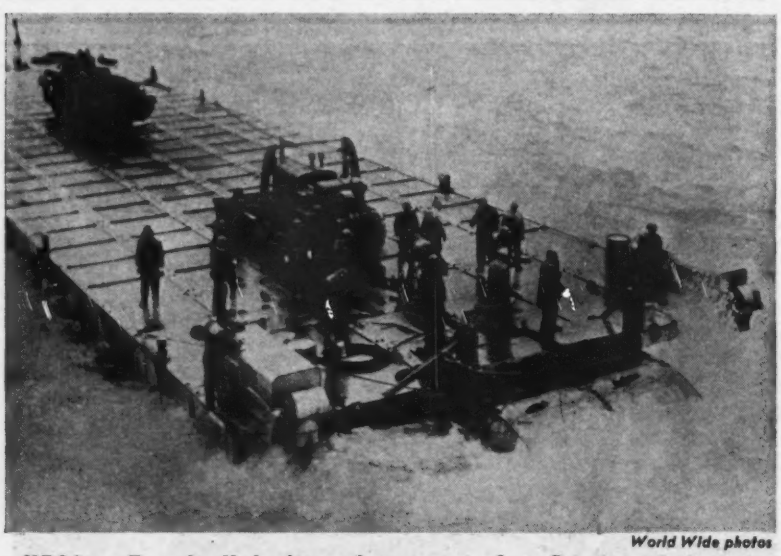
Construction of the proposed projects in Washington, Oregon and Idaho would be undertaken only with the approval of the people of the area affected, it was stressed. Such approval would be necessary because many of the developments would require special legislation.

Mr. Banks explained that the acreage of the new land which would be brought under irrigation by the 36 projects proposed for the Pacific Northwest —1,688,000 acres—would equal about half of that now irrigated in the tri-state region. Cost of the new construction would be more than twice the Bureau's expenditures in the three states to date.

Twenty projects in Idaho were tentatively included in Mr. Ickes' inventory. They would serve 290,550 acres of new land, provide supplemental supply to 1,709,260 acres, increase power installations on authorized projects 70,000 kw., and on projects under study by 150,000 kw. Expenditures in Idaho would total $169,000,000.

Four Washington projects are named in the inventory, the largest being the 1,000,000-acre Columbia Basin development, on which Grand Coulee dam is the key structure. The proposed construction in that state would bring 1,131,000 acres of new land under irrigation, supplement the water supply for 6,000 acres, increase power installations on authorized projects by 852,000 kw., and provide 622,000 kw. of firm power on projects being investigated. Cost of the program in Washington would total $369,900,000.

Oregon's 15 projects, which would cost $59,681,000 to construct, would serve 253,824 acres of new land and augment the irrigation supply for 92,700 acres, now inadequately watered. They would also make available 8,500 kw. of new firm power on projects under study.



World Wide photos

"Rhino Ferries" is invasion name for Seabees' Jeeps

The small pontoons units of the Seabees (ENR April 21, vol. p. 540) are being used in the invasion thrust carrying needed equipment up on the beaches where it can be driven ashore. The pontoons are 5 x 7 ft. in plan and 5 ft. deep. Outboard power units are set on the pontoon deck for propulsion.

Strings of the pontoon units are connected, then pinned together to make any size vessel desired and it will carry a considerable invasion load. Enemy action can damage only a few at a time of the several units in a barge and the rest, entirely independent, continue to support the load.

The pontoon barges were developed by the Bureau of Yards and Docks of the Navy and are operated by Naval Construction Battalions, the Seabees.

• • •

Tunnel holed through on Big Thompson project

Holing through of the 13-mile tunnel under the Continental Divide was accomplished June 10 as part of the Colorado-Big Thompson reclamation project, which is to bring irrigation water from the Colorado watershed to that of the South Platte River, a tributary of the Mississippi. The tunnel, located near Estes Park, Colo., is to be named after the late Senator Alva B. Adams of Colorado, in recognition of his efforts in securing approval of the undertaking.

The S. S. Magoffin Co., of Englewood, Colo., held contracts for driving the final section of the tunnel from the eastern end. In the western end, Platt Rogers, Inc. of Pueblo, Colo., drove 6,000 ft. and Stiers Brothers, St. Louis, Mo. drove the final 8,000 ft. to meet the crews working from the east end.

Secretary of the Interior Ickes has announced that the Bureau of Reclamation will rush the concrete lining operations and completion of other facilities, so that water can be delivered for next year's crops.

The project is intended to bring supplemental water to 200,000 acres of highly productive farm land in northeastern Colorado. Ultimately, it will divert over 300,000 acre-ft. of water annually from the headwaters of the Colorado River to supplement the water supply for 615,000 acres in the South Platte River drainage area.

Beach erosion control group holds first annual meeting in three years

Federal officials and public works engineers review latest methods of shore and beach erosion control. Steel, concrete and treated timber to play important parts in future work

Modern methods of preserving the nomic and recreational values of shores and sea coasts against ero- were outlined in detail at the 16th ual meeting of the American Shore Beach Preservation Association d on May 31-June 1 in Chicago.

"Wave action does not halt because are at war,"

J. Spencer Smith

J. Spencer ith, president the association his opening ad- s to the 100 embled federal city officials, y engineers constructors shore protec- works.

Due to con- ted wartime travel, no annual etings have been held by the as- iation since 1941. But the increas- need for beach erosion control and re line protection, together with the twar aspects of this work, led the ers to resume the yearly meetings.

Concrete sheetpiling needed

A heavy concrete sheetpiling should developed to be used like steel sheet ng in groins, jetties and other shore- nt structures, suggested Brig. Gen. n J. Kingman, senior member, U. S. ch Erosion Board. Such piling ld function well in localities infested marine borers which attack timber, it could be used advantageously re steelpiling is exposed to exces- corrosion or severe sand abrasion said.

"Concrete sheetpiling groins have n used successfully on the Missis- pi Sound," said Gen. Kingman, "but design employed there is too light more exposed localities. The dura- ity of concrete warrants an attempt develop sheetpiling design suitable ocean shore lines."

Sound concrete is essential

Close attention must be given to the ality of concrete used in sea walls and er shore protection structures if they to withstand indefinitely the expo- re to which they are subjected, de- red L. H. Corning, assistant manager, uctural bureau, Portland Cement sociation. Watertight concrete is essential, he warned, and excessively wet mixes, unsound aggregates and prolonged puddling should be avoided lest a pervious concrete is produced which deteriorates rapidly due to expanding salt crystals or is shattered by freezing and thawing.

Mixing water, including that contained in the aggregates must be kept below 5½ gal. per sack of cement, said Mr. Corning. Reinforcing steel should have at least 3-in. of covering and 4-in. at corners of all shore protection works. High-frequency vibration of low water-cement ratio concrete is advisable for such structures, and they should be cured properly for at least seven days, he said.

Treated timber for shore protection

That pressure creosoted timber is a reliable material for beach and shore protection installations is proved by its use in marine and waterfront structures for over 100 years, declared Ralph H. Mann, engineer, American Wood Preservers Association. Coal-tar creosote is the most reliable preservative for timber used in shore protection works and it offers the additional advantage of protection from decay, termites and marine borers. The maximum practicable absorption of creosote is advisable for piling in salt water and exposed to marine bore attack as well as decay, he said.

Treatment by the full-cell process is recommended for such installations, asserted Mr. Mann. Pine piles should have a 20-lb. per cu. ft. final retention and Douglas fir should have a 14-lb. treatment. Fresh water or inland structures, on the other hand, require protection from decay only, and a 10 to 12-lb. treatment is generally adequate for all species, he said. Mr. Mann illustrated his talk with slides showing typical timber piling installations.

Abrasion of steel piling

Steel sheetpiling is well suited for making permeable groins by driving occasional piles below the general grade to permit passage of water and sand, said R. J. McIntosh, manager of sales, Bethlehem Steel Co. The shape of a pile section has little bearing on its resistence to abrasion by sand in swiftly moving water. This is borne out by recent reports on test installations of steel sheetpiling at Palm Beach, Fla.

Creosoted timber plank sheathing offers the most practical and effective protection against abrasion of steel pile groins, said Mr. McIntosh, and this method can be used advantageously at many installations.

Lake shores and sea coasts are assets for promoting health and well-being of the people of the nation. And as such, they are entitled to proper protection from damaging erosion, declared Newton B. Drury, director, National Park Service.

George P. Larsen, executive secretary of the Shoreline Planning Association of California, reported on recent shore protection activity in that state. He said the State Park Commission is proceeding with plans for creating an office of state beach erosion control engineer, as directed by the 1943 legislature. Warren T. Hannum, state director of natural resources, and chief, division of beaches and parks, State Park Commission, Sacramento, will soon issue the civil service examination requirements for the job.

All present officers were reelected for the forthcoming year.

Tongue and groove sheetpiles of creosoted Douglas fir extend 16 ft. above low water to protect high banks at Long Branch, New Jersey.

Eight-mile Swedish-Danish tunnel proposed for Strait of Oresund

Postwar project will require special excavators for economical construction of world's longest underwater tunnel.

Plans are ready for an early start after the war on construciton of a tunnel to connect Denmark, near Copenhagen, with the Swedish mainland near Malmo, passing under the Strait of Oresund. The strait at this point is very shallow—only 35 ft. at deepest point—and the bottom consists of layers of hard sand and limestone. Thus, it will be practical to use the open trench

method of construction, but the scheme will require the building of very special excavators for a deep and wide trench under water. The tunnel will come up to the open on the Island of Saltholm, a little more than three miles from the Danish side, and more than 4½ miles from the Swedish side of the strait. The nearly eight-mile length is said to make this the longest underwater tunnel in the world.

Plan for construction is to build a graving dock at each of the four places where the tunnel goes under water. The tunnel sections, each 165 ft. long will be built in the graving docks at the rate of one every three weeks, and will then be floated out and sunk to position in the open trench. After the tunnel sections are complete, the full length of the graving dock becomes the open approaches to the tunnel.

As will be noted from the cross section of this tunnel, it is a rectangular box and will have space for one track for an electric train, and a two-lane highway with a catwalk on one side. The road will be 22 ft. wide, a little greater than ordinary American tunnels. Traffic capacity will be 8,000 motor vehicles and 60 trains in each direction per day. Ten ventilation towers, at an average spacing of 3600 ft. along the tunnel, will make possible a renewal of air every other minute when the tunnel traffic reaches its peak.

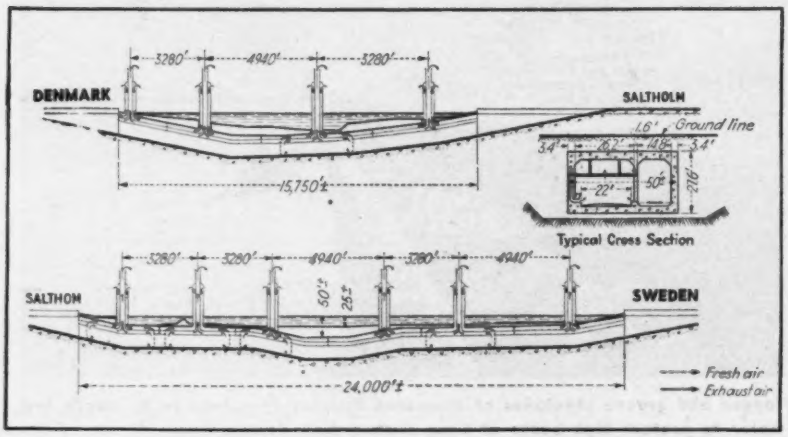
The tunnel is expected to require some 200,000 tons of cement, and 1,300,000 cu. yd. of sand and gravel. Estimated cost is almost $50,000,000. It is expected that a part of this cost will be offset by increase in the value of the Island Saltholm, the 10 sq. miles of which is at present uninhabited and almost worthless. With rapid access by the tunnel it will become a suburb of Copenhagen and will undoubtedly be popular as a summer resort.

A toll to be imposed on all trains, vehicles and passengers is expected to cover the maintenance and fixed charges and yield a small dividend on the investments, which will most likely be under government control.

The natural affinity and friendship between Denmark and Sweden has long made the connection under the Strait of Oresund desirable. Division of the world into spheres of influence has strengthened the feeling of unity in the Scandinavian countries and made this tangible link a mutual project.

Planning of this tunnel has been carried out in minute detail, in Denmark under the supervision and leadership of N. J. Manniche and in Sweden by J. V. Dalhoff, Managing Director of the Association of Engineering Firms. Detail plans have been prepared largely in Denmark where current construction and engineering work would benefit the Germans so well reputed firms have been concentrating solely on post-war planning. Sweden has had more heavy construction work during the war than in normal times, largely fortifications and other measures in preparing the country for defense against possible aggression.

Mr. Dalhoff is at present in the United States investigating the possibilities of securing the special equipment required for the unusual tunnel excavation and other machines necessary for a project of this size. The machine particularly sought is an excavator to travel on the ocean floor and dig out the trench, thus avoiding the limitations of floating equipment. Mr. Dalhoff also has been seeking information on American practices and suggestions from American tunnel builders.



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WPB interested in waste from the Potomac River

A subcommittee has been appointed by the Potomac River Interstate Commission to make an investigation of problems involved in pollution of the Potomac River, and for purposes of recovering valuable industrial wastes. The War Production Board is interested in the latter in view of putting such wastes to use in connection with the war effort.

Members of the committee include Edwin R. Cotton, engineer-secretary of the commission; George L. Hall, chief engineer of the Maryland State Department of Health; Richard Messer, director of the division of sanitary engineering, Virginia State Department of Health; J. D. Harrington, director of the West Virginia bureau of sanitary engineering; H. E. Moses, director of the Pennsylvania State bureau of sanitary engineering; and Ralph E. Tarbett of the U. S. Public Health Service.

o federal agencies rebuked by WLB upgrading construction labor

as contractors testify they had to pay 70c. an hour because would not work for 55c. Houston would turn down FWA grant 400,000 for waterworks project because of extra cost.

o Texas cities—Dallas and Hous-here have been developments re- of interest to all contractors in tion with the matter of construc-bor wage scales.

r nine building contractors had red for a hearing before a 3-man Labor Board panel at Dallas on 2 and 23 on a charge of upgrading on labor, the panel rebuked the al Public Housing Administration the United States Employment e for having told the contractors o do it.

e panel found that unstabilizing practices were being used in con-n with the common labor wage paid in the building industry. The recommended that the Eighth nal War Labor Board order con-rs to quit hiring new "common " at the 1942 wage rate for "build-bor." This has had the effect of sing the lowest hourly wage scale ilding work in the Dallas area 55c. to 70c. because 70c. is the et for "building labor."

e building contractors summoned e the panel are employed on the al government's temporary hous-rojects in the Dallas area. They charged by War Labor Board with g unskilled common labor not the an hour they should be paid under adjustment rating, but 70c. an the semi-skilled building labor

the hearing, two of the contractors ied that their present contracts, g for building labor at 70c. an and common labor at 55c. an hour, the first they had ever known of vide labor into such classes, that l their previous experience there been one class, namely, building

ree of the contractors testified that had to pay 70c. an hour because would not work for 55c. One of produced a letter from the United s Employment Service, which sug-d that he upgrade his jobs at the an hour rate because theUSES d not provide labor at the 55c. rate. her contractor showed a letter from Federal Public Housing Adminis-on engineer supervising the proj-which authorized him to pay the an hour rate.

e building contractors and the affected unions have petitioned Washington for a change in the labor classification that would provide a single class for building labor instead of the two classes of common labor and building labor and the panel recommendation will supplement this petition.

FWA grant rejected

The Houston city council has voted to reject a $400,000 Federal Works Administration grant for water improvement work because, according to J. M. Nagle, city utilities director, a condition of accepting the grant would be to let the FWA set the labor wage rates on $3,600,000 worth of work. Workers laying water pipes would have to be paid $1.62½ an hour according to the plumbers' scale, with time and a half for work in excess of 40 hours a week, whereas the city's rate for skilled labor to do this work is only 75c. an hour, straight time. The grant was conditioned on the city's getting priorities without federal aid.

It was the opinion of James W. Bradner, regional director of the Federal Works Administration at Fort Worth, that Houston's refusal to accept the FWA grant would not keep it from obtaining its priorities.

A decision on the labor scale matter is considered important now because Houston plans to finance the water improvement work by issuing water revenue bonds, and June 17 has been set for the $14,000,000 bond election.

Houston plans to construct a reservoir and dam on the San Jacinto River, develop 12 more wells, build a 50,000,000-gal. filter plant, improve the city water pressure by extending water mains and buy the West Canal of the Federal Works Administration project on the San Jacinto River.

MEN AND JOBS

Max B. Miller, who resigned June 1 as director of the Petroleum Administration for War's Construction Division, is succeeded by **George Gibson,** who has been assistant director since last November.

Mr. Miller resigned to resume his duties as president of the Max B. Miller Co., petroleum industry refinery consultants. He had been with PAW for over two years, first as assistant director of refining, and since last July as director of construction, under whom the 100-octane refinery construction program has gone forward.

Mr. Gibson, after 11 years as chief process engineer for the C. H. Leach Company, New York City, had been serving for a year as refinery technologist and consultant of the Hancock Oil Company, Long Beach, Calif., when he joined PAW in 1941 as a refinery materials expert.

Capt. A. L. Anderson, public relations and field officer of the United States Engineers, Little Rock, Ark., has been promoted to major. He was with the Minnesota State Highway Department before the war started.

Harry Gehm, formerly research associate at the New Jersey Sewage Experiment Station, Rutgers University, is now technical adviser for the National Council for Stream Improvement of the Paper, Pulp and Paperboard Industries.

T. B. Gunter, Jr., acting bridge engineer, N. C. State Highway & Public Works Commission, Raleigh, N. C., has been named chief bridge engineer. He has been with the highway department for the past 21 years as draftsman, designer, resident engineer, senior designer, assistant bridge engineer and acting chief engineer.

A. B. Mason, formerly field engineer and designing engineer with the International Boundary Commission, has entered private practice as a civil engineer in San Benito, Tex.

(*Continued on page* 144)

JOBS OF THE WEEK

WAVES BARRACKS, Arlington, Va.

Bureau of Yards & Docks, Navy Department, Washington, D. C., awarded a contract for Waves barracks to Jeffress-Dyer Inc., Washington, D. C., at $1,499,963.

RAILROAD, Washington

Bureau of Yards & Docks, Navy Department, Washington, D. C., received the lowest bid for 23.5 mi. railroad from Mason to Kitsap County Line, to Bremerton Navy Yard, from Sound Construction & Engineering Co., and Peter Kiewit Sons Co., Seattle, Wash., at $2,341,340. A 26-mi. section is under construction.

HOUSING, Baltimore, Md.

Baltimore Public Housing Authority, Baltimore, Md., received the lowest bid from Ross Engineering Co., Washington, D. C., for 600-unit housing project Cherry Hill, at $3,350,000. Whitman, Edmunds & White, Baltimore, Md., are the architects.

AIR STATION FACILITIES, Virginia and North Carolina

Bureau of Yards & Docks, Navy Department, Washington, D. C., awarded a contract for additional air station facilities, including personnel buildings, storage, parking areas, at Pungo and Creeds, Va., and Manteo, N. C., to Grannis, Thompson, Street & Wattinger Co., Charlotte, N. C. at $1,391,000.

Note—Additional bidding and contract news on many projects large and small appear in the Construction News section beginning on page 159.

Named to aid A.S.C.E. postwar planning group

At a meeting called by the research and development division recently created by the American Society of Civil Engineers' committee on postwar construction, three men were named to work with the division, also to be assisted by *Engineering News-Record* and the F. W. Dodge Corp., in finding some means of obtaining reports on a nation-wide basis of proposed housing costing less than $150,000, which is the minimum reported by *ENR*.

The men appointed are F. Stuart Fitzpatrick, manager of the construction and civic development department, U. S. Chamber of Commerce; Samuel J. Dennis, acting director, housing market service, National Housing Agency; and Robinson Newcomb of the War Production Board's bureau of planning and statistics. They will report their findings at another meeting to be held in Washington, June 22.

The purpose of the A.S.C.E. committee is to stimulate planning, acquisition of land, and construction financing, so that projects will be ready for taking bids when the war ends (*ENR* April 6, p. 455). Estimates will be used primarily for gaging employment, forecasting need for materials.

Hugh R. Pomeroy, executive director of the National Association of Housing Officials, presided at the recent meeting. Mark B. Owen, director of the A.S.C.E. Research and Development Division, outlined the need of the proposed program.

John W. Cowper dies, Buffalo engineer

John W. Cowper, 73, founder and president of the engineering and contracting firm of John W. Cowper Co., Buffalo, N. Y., and a former president of the Associated General Contractors of America, died June 7.

Born in Suffolk, Va., Mr. Cowper began his career in 1887 as rodman on the Queen and Crescent Route at Cincinnati. Subsequently he became supervising engineer of the Cairo and St. Louis divisions of the Cleveland, Cincinnati, Chicago & St. Louis R. R.

In 1901 Mr. Cowper went to England for James Stewart & Co. to build $8,000,000 plant for the Westinghouse Electric Co. at Manchester; he remained there to supervise construction for his firm of the Midland Hotel, Manchester, the Savoy in London, several power stations in England and Scotland. During the years 1907 to 1909 he was branch manager for Stone & Webster in Milwaukee and Pittsburgh. After a brief period with the Worden-Allen Co. as a vice president he went to the Lackawanna Bridge Co. in a similar capacity.

In 1915 Mr. Cowper organized the John W. Cowper Co. and since then the company has fulfilled contracts totaling $75,000,000, constructing public buildings, industrial plants, office buildings, hotels and bridges.

John W. Cowper

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Aviation Engineers land with invasion forces

In the first four hours of the invasion of France, Aviation Engineer battalions—highly mechanized construction units of the U. S. Army—landed and were soon at work building flight strips and airbases.

Few if any U. S. Army battalions have more construction equipment and man than the Aviation Engineers. Officers of these units are officers of the Corps of Engineers, and the enlisted personnel are especially trained on airbase construction. The units are operated under the command of the Commanding General, U. S. Army Service Forces, but in some cases they may operate under the Army Service Forces.

The Aviation Engineers battalions which were first organized in 1940, have played an important part in the building of bases in the Aleutians, Africa, England, Italy and the Pacific. Some battalions have been airborne, landing with midget tractors and earthmoving equipment, such as those flown in behind the Jap lines in Burma.

Although the Aviation Engineers have always been supplied with rifles, carbines, and some other fighting equipment, in the past they were organized primarily to do construction work. In contrast, the battalions landing in France were equipped for hard fighting, having available bazookas, anti-tank and anti-aircraft guns, grenade launchers, and armored halftracks.

Brig. Gen. James B. Newman, of Washington, D. C., is commanding officer of the Aviation Engineers forces now stationed in France. Before going to the European area, General Newman was engaged on the construction of a number of United States airports, including the Washington national airport.

OBITUARY

lfred G. Ranney, 54, former mem- of the firm of Bartlett and Ranney, sultant engineers of San Antonio, , died May 27. Mr. Ranney had n working as a civilian employee the U. S. Army Engineers.

ohn Hampden Randolph, 65, a mer city engineer of Palatka, Fla., a member of the engineering de- tment of the Florida State Highway partment for several years, died May

Adolph H. Koebig, Sr., 92, senior mber of Koebig and Koebig, consult- engineers of Los Angeles, Calif., d May 24.

Charles F. H. Foard, 55, associate ef engineer of Baltimore, Md., died e 1. Mr. Foard for the last two rs was manager and engineer at the nicipal airport, completion of which supervised. He entered the city's vice in 1917. He was a field engineer street maintenance until 1920, and er headed the maintenance division the bureau of highways.

Howard E. Satterfield, 67, builder d architect, died at Raleigh, N. C., y 27. He had been a member of the culty of the North Carolina State Col- e school of engineering, and also was general contractor, except in 1935-36, en he served as regional director of chitecture and engineering for the settlement Administration.

John L. Caldwell, 61, city manager Chapel Hill, N. C., for the past 12 ars, died June 3. He was a graduate engineering from Clemson College in 05, and went to Chapel Hill in 1928 office manager for the T. D. Thomp- n Construction Co.

Douglas Starke Perry, 53, civil engi- er, died recently in LaGrange, Ill. e was in charge of pipeline construc- on for the Natural Gas Pipe Line Co. America, Chicago.

Theodore A. Theban, 65, a civil engi- eer attached to the office of the presi- ent of the Borough of the Bronx, New ork City, for 45 years, died June 5.

Peter D. Locatelli, 68, founder and enior member of Peter D. Locatelli and ons, Laurium, Mich., died May 18. He ad been a general contractor there for ver 40 years and had constructed many public and industrial buildings in Michigan and Wisconsin.

Archie E. Palen, 61, former district engineer for the Public Roads Administration for Colorado, with headquarters at Denver, died recently.

Edward D. Very, a consulting engineer specializing in municipal refuse incinerator designs, died May 27 in Allendale, N. J. Before entering private practice, Mr. Very had a wide experience with waste disposal problems in New York and Philadelphia.

WPB reports construction volume increase for May

The construction volume in May, for the first time since August, 1942, showed an increase over the previous month, according to the War Production Board's Bureau of Planning and Statistics. The preliminary estimate for May is $295,000,000, which is a 3.5 percent increase over the slightly less than $285,000,000 for April.

The main increases were noted in military activity which went up about 17 percent, from $46,000,000 in April to an estimated $54,000,000 in May; and in non-residential construction which increased about 12 percent, from $110,000,000 to an estimated $123,000,000.

Housing continued to decrease, the May volume being about five percent less than the $61,000,000 for April. Factory construction declined an estimated seven percent while machinery and equipment deliveries were down four percent. The only type of plant which showed sizably increased construction activity was ordnance. This increase was due to expansion in plants for specialized types of materiel.

WPB estimates that the upward trend in construction will continue for the next few months before showing an expected seasonal decline, and comments that the long downward trend has at least been halted. Total construction activity for the year, however, is still estimated at about $3,550,000,000, which is 46 percent of the 1943 figure and 27 percent of the 1942 volume.

Of the May figures, publicly financed construction accounted for 61 percent of the total, and privately financed for the rest. Because alterations and repairs are not included in these sums, WPB's estimates differ from those prepared by the Bureau of Labor Statistics which included allowances for such types of work.

WEEKLY CONSTRUCTION SUMMARY

CONTRACTS

Continental U. S. Only
(Thousands of Dollars)

	Week Ending June 17 1943	June 8 1944	June 15 1944
Federal	$34,313	$20,706	$15,554
State & Municipal	3,671	7,256	7,877
Total public	$37,984	$27,962	$23,431
Total private	6,250	14,961	5,791
TOTAL	$44,234	$42,923	$29,222

Cumulative
1944 (24 weeks) $829,378
1943 (24 weeks) $1,712,510

Note: Minimum size projects included are: Waterworks and waterways projects, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

NEW PRODUCTIVE CAPITAL

	Cumulative 1943 24 weeks	1944 24 Weeks
NON-FEDERAL	$95,987	$190,850
Corp. Securities	3,571	83,139
State & Mun.	80,283	53,931
RFC Loans	9,000	53,780
FPHA Loans	3,133	....
FEDERAL	$400,350	$245,266
TOTAL CAPITAL	$496,337	$436,116

ENR INDEX NUMBERS

Index base=100		1913	1926
Construction Cost	June '44	298.72	143.59
Building Cost	June '44	235.33	127.21
Volume	May '44	100.	44.

MEETINGS

SEVENTH NATIONAL INSTITUTE FOR WARTIME TRAFFIC TRAINING, Northwestern University, Evanston, Ill., June 19-30.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION, 52nd annual meeting, Netherland Plaza Hotel, Cincinnati, Ohio, June 22-25.

AMERICAN SOCIETY FOR TESTING MATERIALS, 47th annual meeting, Waldorf-Astoria Hotel, New York, N. Y., June 26-30.

AMERICAN SOCIETY OF CIVIL ENGINEERS, annual meeting, Hotel Cleveland, Cleveland, Ohio, July 19-21.

Regional and Local Meetings

CENTRAL STATES SEWAGE WORKS ASSOCIATION, annual convention, Oshkosh, Wis., June 22-24.

SHORT COURSE FOR OPERATORS OF WATER AND SEWAGE PLANTS, Louisiana State University, Baton Rouge, La., June 28-30.

News of the Week
Continued on p. 116

Comment and Discussion

Readers' opinions on matters that concern engineers and contractors

Brazil's Rubber Plantation

Sir: With reference to E. J. Cleary's article, "An Engineer's Role on a Rubber Plantation," (*ENR* Mar. 9, p. 322), I know that the people at Belterra, Brazil, are gratified by the fair and factual report on the Ford Motor Co. project. The plantation has been the subject of a number of articles and partial subject of a number of books, and has often been given a very unfair treatment.

It is a bit surprising, however, that the initial action, that is, the clearing of the land, was mentioned so lightly. This job was in itself a tremendous undertaking, since the trees are often 120 ft. tall and so dense that they will not float and are impossible to burn. Even today the jungle surrounding Belterra is so completely dense that only a few trails can be used to go back into the surrounding country.

If anything, Mr. Cleary's statement relative to the good treatment of the native workers is an understatement, as anyone who has worked in a number of parts of Brazil will confirm. This fact, together with the results of a number of years of North American supervision, result in the labor being of better quality than the undersigned has seen in any other location in Brazil.

A. D. ALLEN, JR.
Captain, Corps of Engineers, c/o Fleet Post Office, New York, N. Y.

Concrete Wall Reinforcing

Sir: Theodore B. Rights' letter, (*ENR*, April 6, 1944, vol. p. 461) supports my belief that shrinkage reinforcing steel requirements of 0.0025 times the cross sectional area of the wall, in each direction, is too conservative.

The control of shrinkage cracks in walls is dependent on the bond between the concrete and steel, and I presume the writers of the WPB code had this in mind when they specified a minimum of 0.0025 sq. in. of steel in both directions. However, it has been my experience that this amount of steel is not necessary in the vertical direction, especially for walls ten feet in height and less. Inspections of shrinkage cracks reveals that most of them are vertical.

These cracks can be controlled more effectively by reducing the amount of water in the concrete mix. Excess water leaves voids in the concrete which are conducive to cracks. A wet mix developes a lower bond resistance to the steel during the initial set of the concrete. Providing 0.0025 sq. in. of steel in the horizontal direction only, with sufficient bars in a vertical direction to act as supports, generally a $\frac{3}{8}$-in. round bar 4 ft. on centers vertically, will suffice.

This raises another question. Why use reinforcing steel in its present shape and form at all to control shrinkage? For such conditions where load is not a factor, how about small channels, wood strips, a concrete admixture of some suitable fibrous material?

J. E. LUNDSTRUM,
Structural Engineer, Chicago.

Writing Better Specifications

Sir: The editorial "Defenders Needed" in the Jan. 13, 1944, issue of *Engineering News-Record*, is, perhaps, more of a challenge than may have occurred to you. A competent "assayer" of specifications might be able to select a few good ones from the welter of documents available to him. Yet, to make a competent choice one should have the drawings and all other bidding and contract documents before him before it could be said, with positiveness, that the specification is a good one. Such an "assayer" should know of what a good specification should consist. Very few do know that—yet few will admit they are ignorant of what a specification should be.

However, one who has written hundreds of good specifications during the past 33 years with a continuous conscientious effort to make each one better than those preceding, accepting your challenge. To do so means to assume an attitude of braggadocio and that is not pleasant. For this reason, my name is not mentioned.

The specifications have been written by one who has, throughout the years mentioned, had complete control of the production of drawings and all other contract documents. Not to have this control means inevitable lack of clarity and cohesion and results in all the faults always found in the average specification.

A continuous contact with field construction, with producers of materials, with publications devoted to the business at hand, with lawyers, contractors, business men, educators and even philosophers, has led to constant help in the effort to remain mentally alive and above the ruts of banality.

The drawings are rarely considered a part of the specifications, even though there is a warning in the usual specification that each document is a part of or complementary to the other. So the writer has seen to it that all construction and equipment details are completely shown and explained on the drawings. This has been accomplished largely through an organized set of instructions to the drafting room staff, together with constant checking of the drawings as they are being made, with the specification outline, which is daily kept up-to-date. As a consequence, it has been possible to have drawings produced that have deserved the frequent laudatory comments expressed by contractors and material men, than whom there are no better judges.

Since instructions to bidders, proposals, etcetera, are not really a part of the good specification but should be considered very important parts of the contract documents, they have not been included in the specification. They have been prepared as a separate bound document or so segregated from the form of the specifications that they stand out as being exactly what they are.

The specifications, therefore, are purely specification, completely devoid of instructions that are extraneous to the purpose of the document and solely descriptive of work included, quality of materials, standards of shop and field fabrication, con-

ion and installation, methods of
f desired and special notes as to
ntees.

a necessary corollary to the
fications there are the excellent
eral Conditions of the Contract
Building Construction" of the
rican Institute of Architects and
cument called "Supplementary
ral Conditions of the Contract,"
has been prepared to round out
hilosophy of the author and the
y of his practice.

has been possible, therefore, to
the two general conditions docu-
s, the proposal accepted, the
A. contract form, a few pages of
fications to recite the particular-
of materials desired and a com-
set of drawings to accomplish
od construction program through
good offices of an excellent con-
or.

o explain in detail the full process
which an excellent specification
ld be prepared would be a tre-
dous task, even though the phil-
hy of the writer was published
long series of articles over 20
s ago. Suffice it to say that there
ne specification writer who knows
work has not been in vain. It is
considerable satisfaction that the
or says it is much easier to write
od specification than a bad one,
much more pleasure to contem-
e the comments on the good ones
has written than to hear the re-
ks concerning the "usual or aver-
" specification.

Now, I am certain, you understand
it is rather hard to have to brag
ut good specifications than to
icize only and why I do not wish
be identified by name.

"DEFENDER"

sign of Timber Connections

Sir: In the article "Round Table
cussion of Moisture Content in
mber" (*ENR*, Jan. 13, 1944, vol.
e 39) there are a few points that
m to invite more discussion. It was
nted out in the article that "timber
rinks a maximum of about 5 per-
nt radially, 8 percent tangentially,
l very little longitudinally"; then
s also stated that by fabricating and
ecting timber in a saturated condi-
n, the joints can be easily and
tly assembled and that the struc-
re will dry out after erection with
it being only necessary to tighten the bolts periodically.

In connection with the first point, if 4-in. rings are used and the grooves are $\frac{1}{16}$- in. oversize, the shrinkage in the timber in this distance of 4 in. is greater than $\frac{1}{16}$-in. even when we assume that only one-half of the possible shrinkage is obtained. In joints where connected timbers are not parallel the tendency of this shrinkage would be to split the timber in its weakest direction. The majority of people looking at a joint which has failed in this manner would probably blame the failure on a "characteristic of timber" when in reality the designer should be blamed for not having taken account of the forces present. Too many times engineers seek to shift the responsibility for failures in timber joints to a "characteristic of the timber" or to lack of maintenance. We have conducted tests which show that the looseness of bolts is a minor factor compared with design.

In design, it should always be remembered that the values published for ring connectors are based on tests of three-member connections, and do not present sufficient data to enable the engineer to design a joint having more members under dis-similar conditions. Also it should be noticed that these values for ring connectors do not take into account eccentricities at the joint. For example, a close analysis of any five-member joint, such as is often found in a timber Howe truss, shows that there is an internal stress perpendicular to the axis of some of the members as well as parallel to the axis.

T. R. C. Wilson, senior engineer, Forest Products Laboratory, in his book, "The Glued Laminated Wooden Arch" has recommended that the designer use one-seventh of the stress in compression perpendicular to the grain as the allowable tensile stress perpendicular to the grain of wood. If this value is used and the designer adds up the internal stress perpendicular to the axis of the member caused by the external loads, the internal stress due to variation in moisture content of the wood, the stress caused by shrinkage of the wood when it is restrained by metal connectors and an allowance for the effect of possible loose joints, it is readily seen why a member of a joint will frequently split along the line of the bolts and ring connectors. Such factors should be recognized, and engineers should carefully design timber connections rather than assuming that looking up values on charts is sufficient.

ALBYN MACKINTOSH,
Mackintosh & Mackintosh, Consulting Engineers, Los Angeles, Calif.

Spec's Writers Defended

Sir: After an absence from New York of some months, one of my tasks is to wade through the technical "literature" which has accumulated during this period. It is therefore only today that I have found your impassioned and poetical plea of Jan. 13, p. 24, for a "defender" of those of us who think we are good at writing specifications and contracts of which they are a part.

You should have known that as a class and largely as individuals, we engineers are the most modest of professional men. We do our work well and let the politicians get the credit. That engineers do very well in the matter of writing specifications is evidenced by the fact that in proportion to the work they accomplish they have so little trouble, especially trouble which results in litigation in the courts.

If lawyers were anywhere nearly as good we would have no courts at all for civil actions. Our Supreme Court is noticeable, especially lately, for its split decisions, for its inability to interpret the law. Why pick on engineers?

Far be it from me to say, that contracts and specifications are not at times sloppy, verbose, often ambiguous and too full of details; but that in many cases is the result of trying to plug up holes which lawyers and judges have made.

Fortunately the common sense of most engineers enables them to avoid trouble in spite of legal technicalities. Most of the time we keep our clients out of trouble and out of the courts and that's the proof of the pudding. We are most of us *very good*. You might have said so yourself and saved me the blushes I have at my own surplus of modesty but my skin has been tanned and toughened by many years of exposure to tropical suns, so I sacrifice myself for the good of the profession.

FRED LAVIS,
Consulting Engineer, New York, N. Y.

EDITORIALS

VOLUME 132 NUMBER 24

June 15, 1944

Postwar Lessons from Britain

NOW THAT THE INVASION has started, the men and materials begin to flow out of Britain instead of only into it, postwar reconstruction planning there should speed up appreciably. One reason for this is that the groundwork for progress has already been laid. Postwar planning in Britain, even when bombs were falling, was never considered unpatriotic, and therein lies one lesson for us. There are others, now of more importance, such as Britain's disposition to control land speculation, one of the chief deterrents to effective regional and city planning; her regard for local autonomy even though the reconstruction problem requires solution on a national scale; her sense of reality in planning for an adequate housing program even though it will be twice as large as her construction industry ever handled before; and finally, her vision in recognizing the need for a national planning agency which she then proceeded to set up as a responsible department for government rather than as a committee or a board. It is because these lessons have immediate significance for engineers and public officials in this country that Britain's creditable postwar planning job is described in considerable detail in an article in this issue. In waging war, Britain and America have profited much from mutual understanding. It is reasonable to suppose that the solution of some of our common postwar problems can also be aided by a peace-time version of this same mutual understanding.

Completely Exonerated

NEWS of the complete exoneration of the Carnegie-Illinois Steel Corp. from charges of furnishing defective steel plates to the government and of gross irregularities in testing and reporting test results, will be received with much satisfaction by engineers and construction men. The Truman Committee's sensational charges (*ENR* April 1, 1943) never did ring true. Why should a huge company like Carnegie-Illinois, with a carefully built up reputation, with a high degree of moral responsibility and with unexcelled technical ability, take a chance on trying to load defective plates of ordinary carbon steel onto the government? There was absolutely no reason, and the evidence in the court trial made it clear not only that none of the plates was inferior but that any irregularities in the reports concerned relatively unimportant variations from the specifications. The Truman Committee owes both Carnegie-Illinois and the nation at large an apology for this blunder on its part. A company of lesser stature than Carnegie-Illinois could be ruined by similar sensational charges that were not proved false until a year later.

Uncompleted Army Airports

PRESIDENT ROOSEVELT recently assured a Congressional delegation that an Army order halting construction of 28 airport projects in 17 states would be reconsidered. Although these jobs were once designated as essential to the war program, developments abroad apparently have altered their status in the view of the Army. In wartime, the Army's opinion and not that of local interests should prevail. Perhaps these airports will fit into the peacetime aviation pattern, perhaps not. At any rate, War Department funds are only for airbases that will help the war program. The Congressional delegation should be told just that, and not be given political soft soap in the form of a promise of "reconsideration". If local interests see value in these airports, they can no doubt make arrangements to take them over for completion. Some of them may be excellent local postwar projects.

Always Room for Improvement

THAT such a combed-over field of structural design as movable bridges can yield such a potentially efficient new design as the skewed bascule described in this issue should lend new force to the cliche, "There is always room for improvement". One of the most significant things about the new bridge is the procedure through which its design was evolved. First, all existing designs were analyzed as to their disadvantages. Then a set of specifications, listing the desirable characteristics of a skewed movable bridge, was drawn up, and the new design made to conform as nearly as possible to this ideal solution. Yet this was only the beginning, the real accomplishment being in the structural design itself, where past precedents had to be boldly discarded. The result is a layout in which the majority of the framing is joined at right angles, in which the piers are parallel to the channel lines, in which the load is equally divided between the two trunnions, and in which a minimum of the

ucture is "wasted" by being beyond the clear annel width. Already used in one New York City idge and planned for several postwar crossings re, the "knee girder" skewed bascule represents distinct advance in a field where any major vance seemed highly improbable. In recognition hat accomplishment, this new design should be own as the Hanover skewed bascule after its igner, Clinton D. Hanover, Jr.

TVA for Palestine

E OF THE RESULTS of the war, it has been pointed before in these columns, will be a greater inter- in the Middle East on the part of American gineers and construction men. Indeed, the dis- ssions of the postwar status of the airfields that have built and are operating there and the con- versy over the construction of the Arabian pipe- e already have placed the Middle East directly thin the scope of our interests.

Recently still another engineering proposal for at part of the world was brought forth to challenge r attention and perhaps, eventually, our talents. ews of it came in an announcement by a Jewish ganization in New York, known as the Commission Palestine Surveys, that it is working on plans r a great hydro power and irrigation project for lestine, modeled somewhat after our Tennessee lley Authority plan and called the Jordan Valley thority project (*ENR* May 25, p. 772).

To understand the engineering features of the oject, it is necessary to have in mind the extra- dinary topography of the area involved. Refer- ce to a map will show that Palestine is a rectangle ith a front of about 15 miles north and south ong the Mediterranean Sea, and a width of about 0 miles east and west. Along the eastern border the Jordan River, its headwaters in the north eing at about 2,000 ft. elevation, while its mouth the Dead Sea is 1,292 ft. *below* sea level.

The guiding principle of the plan is to assure at no water shall be wasted. Thus, all the fresh ater of the rivershed is to be impounded by dams the upper reaches, from which it will be con- ucted to agricultural lands through 450 miles of rigation canals on both sides of the downstream alley. The larger dams would also include hydro ower plants. But, as this plan would dry up the ordan River and thus deprive the Dead Sea of nflow necessary to maintain its level in the face of tremendous evaporation losses, there is provided a canal and tunnel to bring 1,000 cfs. of Mediterranean water into the upper end of the valley, from whence it would flow to the Dead Sea in a concrete-lined channel. The drop of 1,200 ft. in this canal would be utilized for other hydro installations.

Originators of this comprehensive scheme, which is an amplification of earlier proposals to develop power between the Mediterranean and Dead seas, is an American, Walter C. Lowdermilk, assistant chief of the U. S. Soil Conservation Service. He has described it in a book, "Palestine, Land of Promise", published by Harper & Bros. several months ago, which is worth the careful attention of engineering readers.

The question as to whether the scheme is practicable rests, like all Middle Eastern modernization proposals, on politics more than on engineering and construction. Its practicability rests on whether Britain, and the world powers in the old League of Nations who granted Britain the Palestinian mandate, can reasonably be expected to overcome the anticipated Arab opposition.

This is not the place to attempt to analyze this highly emotional and complicated question of Jewish-Arab conflict of purpose. It is pertinent to point out, however, that what the Jews have done so far has greatly benefited rather than harmed the Arabs of Palestine, and that it is the Arab aristocracy, fearful of progress that might threaten its power, that is the principal obstructionist element. That British and American oil concessions in the Middle East are vulnerable to Arab uprisings instigated by the Arab chieftans is also a factor that has always delayed the decision to give the Jews full opportunities in Palestine. And as a backdrop to the whole situation is the religious problem, for both Jews and Arabs claim Palestine as a holy land.

Despite the difficulty of resolving this question of divergent interests, there is hope, nevertheless, in many quarters that the end of the war will bring some solution. Judged by what the Jews have already accomplished in Palestine, they, at least, deserve the opportunity of demonstrating what they can do in carrying their plan forward. The Jordan Valley Authority proposal offers that opportunity. Some way should be found to implement it, not only for the benefit of Palestine, but as a demonstration of desert reclamation possibilities for all of the Middle East.

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"Mission Completed"

N. A. Bowers
Pacific Coast Editor, Engineering News-Record

READERS WHO HAVE FOLLOWED the travelogue articles of *News-Record*'s Pacific Coast editor, Nathan A. Bowers, since he left for Pearl Harbor and points west and south last January, will be pleased to learn that he has arrived home with his briefcase bulging with data and pictures of advance base construction operations out there. At least we are sure of the data and pictures, reference to the briefcase admittedly being more hopeful than factual, as the following note from Pearl Harbor makes clear:

"Prepare for expense account item covering one briefcase totally demolished by jungle dampness, ants, termites, mud encrustations, hoof prints, saltwater dunking, rain soaking and jeep scars, and from being used as a cushion on metal bench seats of DC 3's, to say nothing of its being subjected to constantly increased internal pressure as memoranda of interest were crammed in until the seams passed the elastic limit."

But briefcase or not, Bowers' completion of his assignment as a Navy war correspondent makes it possible to announce that the first of a series of substantial, technical articles on construction activities in the Pacific war zones will be published in the June 29 issue. Such articles have been practically non-existent heretofore. And understandably so, because construction men in the armed forces have neither time nor the facilities for writing, and their work, except in its more spectacular or glamorous aspects, is not grist for the mill of the newspaper correspondent.

It was the certainty that under such conditions much of value about war front construction would not reported unless it were done first-hand and now, that *News-Record* editors to England, North Africa, Per Alaska, the Aleutians and Central and South Ameri last year. It was in continuation of that policy that Bow undertook his Pacific assignment.

Something of what that assignment entailed is evide from the accompanying map of his travels, which to him to nearly every site of Seabee and Army Engine construction operations, and up to the fighting fronts at least three locations. What is difficult to appreci are the great distances involved. Admiral Nimitz sa recently that "Our big problem is the Pacific Ocea not the Japs". The Pacific Ocean was Bowers' big pro lem too, for from San Francisco to Pearl Harbor is 2,5 miles; from Pearl to the Marshalls is another 2,000; an from Pearl to New Guinea is 6,500 miles. In all h traveled 28,200 miles.

Few people—admirals, generals and war correspond ents included—have been privileged to visit as man advanced bases in the Pacific as has Nate Bowers o *News-Record*. The important result of all this travel an first-hand observation by a seasoned engineer-reporte will be a better understanding of what construction me are contributing to the Pacific campaign through genera know-how, knowledge of construction machinery, ingenuity and just plain guts. Dr. Bowers' articles, we believe, wi constitute a significant addition to engineering literatur and to specialized war reporting. In this first one he reviews his trip as a background for the substantial tec nical articles that are to follow—THE EDITORS.

WOULD you like to go out in the Pacific and see for yourself? The question was asked and the answer was yes. It would not be the South Sea Isle trip that often beckoned in peacetime, for of late the clean white beach sand of the islands has sometimes been streaked with red, and whole groves of "swaying palms" have been shredded by shellfire and later leveled by grunting bulldozers to make way for air strips and roads. And it would not be pleasant, easy traveling. But you could accept it willingly and with high hopes, realizing that it is worth while to undertak such a trip to learn first hand how im portant a part men and equipment o the construction industry are playing in modern warfare.

First, there are the preliminaries

u'll be leaving "continental United tes" at San Francisco, but you n't know the exact date in advance. u will, however, have plenty of fice about the inoculations you st take before you start, and you uld allow a month for them. Don't nk you know all about them from perience in the last war. Inocula- ns you may have had then were ld compared to the dozen or more u'll need for the South Pacific. hen you've progressed as far as the holera vaccine you'll realize that me mighty hot fighting can go on ht in one's own blood stream—the ttle of the microbe hordes.

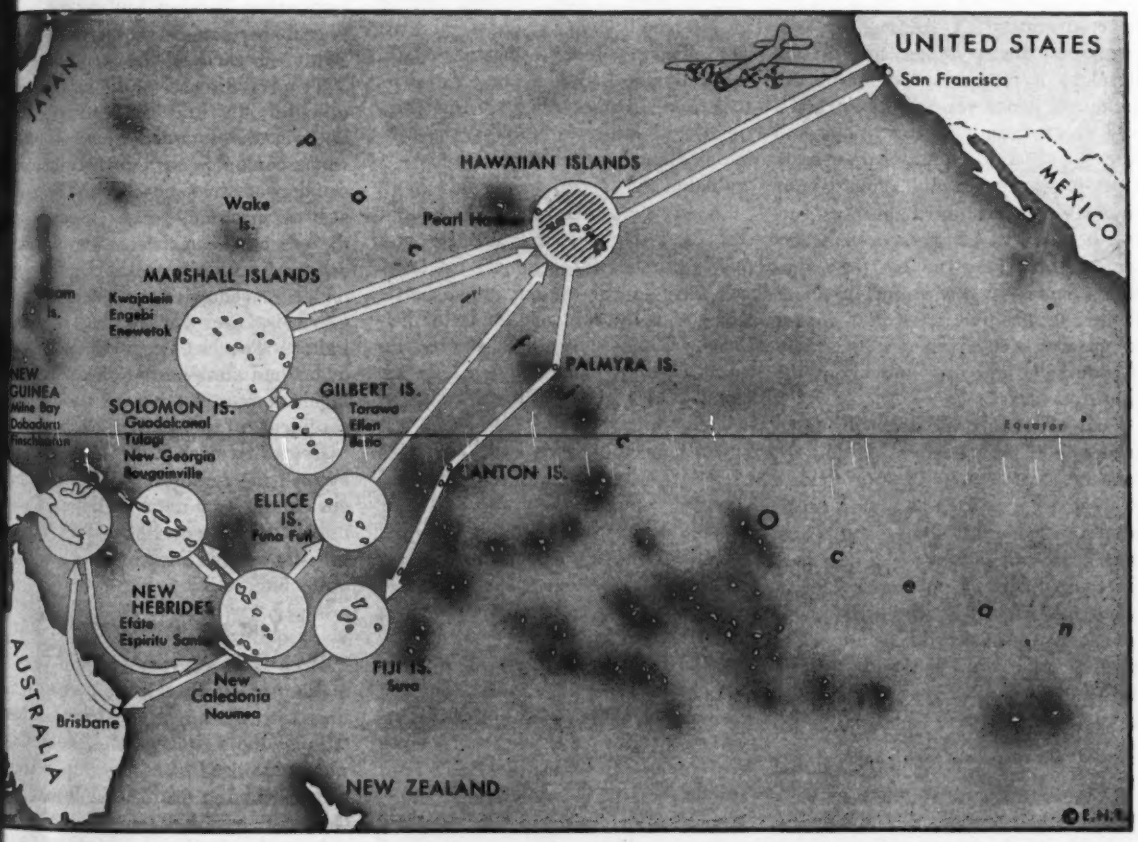
While this is going on you are in- lved in the formalities of getting rtification, accreditation, clearances, pproval, and finally, written orders m the Commander-in-Chief, Pacific eet, so that you have the necessary thority and priority for air travel Navy planes into the battle zones. ese written orders are the first of collection you'll have to make—and rry constantly with you, guarding em as priceles treasure.

The author takes a reading on his exposure meter through an opening in one of the badly shattered concrete structures captured at Tarawa.

Even at the start you know this is going to be a long, hard trip if you do the job thoroughly. To visit spots of major importance and to see the work done on the three fronts down in the Pacific will take you into 46 ports of call and require budgeting of time to make careful inspections of 29 advanced bases. The total travel will exceed 28,200 miles—a distance that would take you entirely around the world with several thousand miles left over for side trips.

Moreover, the luxurious, sound-insulated and air-conditioned planes that private companies operated in peacetime will not be available, and you will find your accommodations to be only a metal bench. The man beside you is as likely to be an Army technical sergeant or a Navy rating as a general or an admiral. Priority, not rank, governs. You will learn, too, that the plane schedules are fitted to the needs of war, not to the convenience of passengers.

But physical discomfort and lack of conveniences are of small moment when you realize that you are riding a Navy plane that is only temporarily serving as air transport. If the need arises, next week it may again carry bombs.



Bowers' 28,200-mile trip hit 46 ports of call and permitted careful inspection of 29 advanced bases, the better known of which are noted with their respective island groups.

Bowers photo.

Out in the Pacific sometimes our structures are built like this one with native cocoanut logs, U. S. lumber, pierced steel mat and sandbags.

Despite your engineering viewpoint and the primary purpose of inspecting construction activities, you find that you have interests and feeling rooted more deeply than the principles of engineering. A lifetime in temperate Northern climes usually dedevelops a viewpoint not easily set aside and hence you will be intrigued and amazed, in turn, by things you find along the equator that seem topsy-turvy. For example, among your discoveries will be bird choruses during the hours of darkness, ocean water too warm to be attractive for swimming, bats of huge size that fly about in bright sunshine, trees that appear to grow upside down and fish that, despite gills and fins, run about the shore on legs.

One of your problems will be to recognize misinformation. If you are to steer a true course in your reports you must carefully weigh and check whatever you jot down. Also you must learn not to make inquiries that are more likely to embarrass than to bring out what you want. You will have to evade some willing informers eager to take your time, and you will have to seek out others who have the facts on what, why and how.

Your personal equipment

It is unfortunate to have to say: "I wish I had brought * * *" and yet, remembering that you will travel by plane with many moves in prospect, you should avoid unnecessaries.

A common mistake to to take shirts of light material, such as poplin, in the belief that they are cooler. After you've been in the Solomon Islands awhile you'll have a strong preference for shirts made of a heavier cloth, such as chino. When perspiration is streaming from every pore, the thin, light cloth clings to the skin; the stiffness of heavier cloth tends to leave a valuable air space beneath it.

A canteen, refilled with forethought for each day's need, will save you many thirst-tortured hours. Canteens are hard to borrow out in the battle zones, but the contrary holds for helmets. When you get to where you need a helmet chances for a loan are good. Dark glasses should be listed as a necessity.

On long hops, such as all-day trips in a four-motored ship, the crew will have facilities for cooking, and they usually share meals with passengers. On shorter hops, often prolonged past meal times, the experienced feather merchant will go prepared with a snack for a plane lunch. A few chocolate bars are ace high.

Chances are against your having a camera permit. Few are granted now. If you do have the worry of caring for camera and films in the humid tropics you will save yourself much anxiety about moisture damage and will avoid all the nuisance and bulk of moisture-tight containers, anhydrous chemicals, etc., if you understand and make use of the principle of the hot cabinet.

In the very humid regions, where mold can form on leather in one night, most of our camps of any permanence have hot cabinets. Often each officer has one of his own in which he keeps articles of leather and other personal belongings subject to quick damage by moisture or a tendency to mold. Any cabinet, closet or just a large box in which you can keep a lighted electric lamp constitutes a hot cabinet.

Risks and dangers

If you try to take out special insurance for this trip, after you find that your ordinary life insurance policies don't apply in war zones, you'll find the premium rates high; about 10 per cent. The facts are, however, that even going up to the front lines in Pacific theaters of operation involves relatively little risk from bombs or bullets as compared to the risk from tropical diseases. Despite modern medical discoveries the score on casualties in U. S. forces, when making comparison between bullets and bugs, is probably somewhere between 15 or 20 to 1 in favor of the bugs.

Tropical diseases of the kinds transmitted by flies and lice need be feared only in the forward lines of battle where combat conditions preclude our usual protective measures. The menace of mosquito-borne diseases, on the other hand, exists at many points on your route of travel. Four of these, malaria, yellow fever, dengue and filariasis, are not to be regarded lightly. The last two, with which we have had less experience, require much more study before we can feel confident of protective or remedial measures. However, we have at least learned the importance of separating our camps from native villages. Proximity to native victims facilitates transfer of the infection by the mosquito bite.

Your engineering report

Even before you thought about making a Pacific trip you were familiar with the naval construction battalions, the Seabees, and how they were organized after the Jap seizure of construction projects at Wake and Guam. You would remember the article on their military training (*ENR*, Sept. 24, 1942, p. 415) and you would

ize that to see these construction kers in action at their best you ld have to go right up to the front s. Seabees follow combat troops closely.

n the Pacific theaters, therefore, u were down there early this year, would have gone up along the Guinea coast to our furthermost ost, at that time Finschhafen. n up through the Solomons to okina on Jap-held Bougainville nd and, finally, through the Gil- s and Marshalls to Eniwetok, our st westerly Central Pacific base. hen you arrive at Munda, New rgia Islands, you have an oppor- ity to see this contrast between anese and our own construction rations. Here we captured the en- y's equipment and had, therefore, ortunity to study his methods and results as compared to our own rations at the same spot. The Nips not a single dump truck; instead, t quantities of picks and shovels innumerable baskets used by lies for carrying material from row to fill.

hen our combat troops came ore, on the other hand, they were ely followed by our largest size vy construction equipment that ediately began clearing the way an air strip more than twice the gth of the one the Nips had.

fter you had inspected a good y of our advanced bases, sat in the ferences held by capable officers seen tools and equipment adroitly dled by eager, energetic and skill- workers on roads, air strips, piers, rehouses and camp construction, would feel firmly convinced of certainty of our ultimate victory. nces are you would sit down and h off memoranda something like :

Construction of the advanced es, which have made possible our itary successes in the Pacific, has n one of the great achievements of war. The story of this construc- is the more significant because work has been carried on with a ed and efficiency possible only h large size construction equip- t in the hands of experienced op- tors. Construction crews working er combat conditions are apply- the skill acquired under peacetime petitive conditions. This skill, out he Pacific, has not been directed profit-making, but has been con- trolled by the more stimulating incentive of saving time and materials in a life-and-death race to make up for the unpreparedness with which we first faced the enemy. Even as this is written that race has been won. We have more than made up for that unpreparedness. We are well along the way to victory. And this will be a victory in which, for the first time, the construction industry, in wholesale manner, has supplied men and equipment to play a major role under military direction.

"No other nation has manufacturing facilities for the quantity production of heavy construction equipment necessary to operations such as we have been carrying on. Bulldozers, draglines, trucks and carrying scrapers in unbelievable quantities are moving forward continually to our advanced bases where capable hands put them to work with the same spirit and dash that characterize our fighting forces."

When you can look back over the whole trip in perspective and sort out your notes you may find that they yield substance for at least half a dozen major articles. Some of them can be titled:

Utilizing natural cementing qualities of coral for air strips and roads.

Steel pontoons earn their place as important construction implements.

New methods for unloading heavy equipment on hostile shores.

Perforated steel sheets, a new prefabricated material for emergency construction, especially on air strips.

Byproducts and impressions

But these rather serious reports in copy form are of necessity stiff and formal compared to the impressions and personal experiences you will treasure away as pay for your pains. Some of the impressions can be recorded. For example, while you were on tour and before you could be expected to have the over-all perspective, you might write memoranda in lighter vein which the editor could print as travelogues, winding up with a sort of summarizing finale like the one in *ENR*, May 25, 1944, vol. p. 773.

Also you probably couldn't entirely suppress your admiration for some of the great leaders in engineering activities out in the Pacific and the result would be a word picture of General Casey (*ENR*, April 27, 1944, p. 635) and one on Admiral Cotter.

But after three long months of being on the job day and night, seven days a week (as all our fellows out there are) you'll prepare to leave Pearl, homeward bound, with a very sincere feeling of appreciation for the opportunity of making the trip, and this will be mingled with thankfulness that it is now behind you. Following the traditions of the Navy that has been your host for these memorable months, you take a deep satisfaction in wiring your boss the report occasionally sent battle fleet commanders: "Mission completed; returning to station."

Bowers photo.

Good coral deposit underlies a cocoanut grove in the Solomon Islands. Bulldozers at left aids shovel in keeping a string of trucks moving.

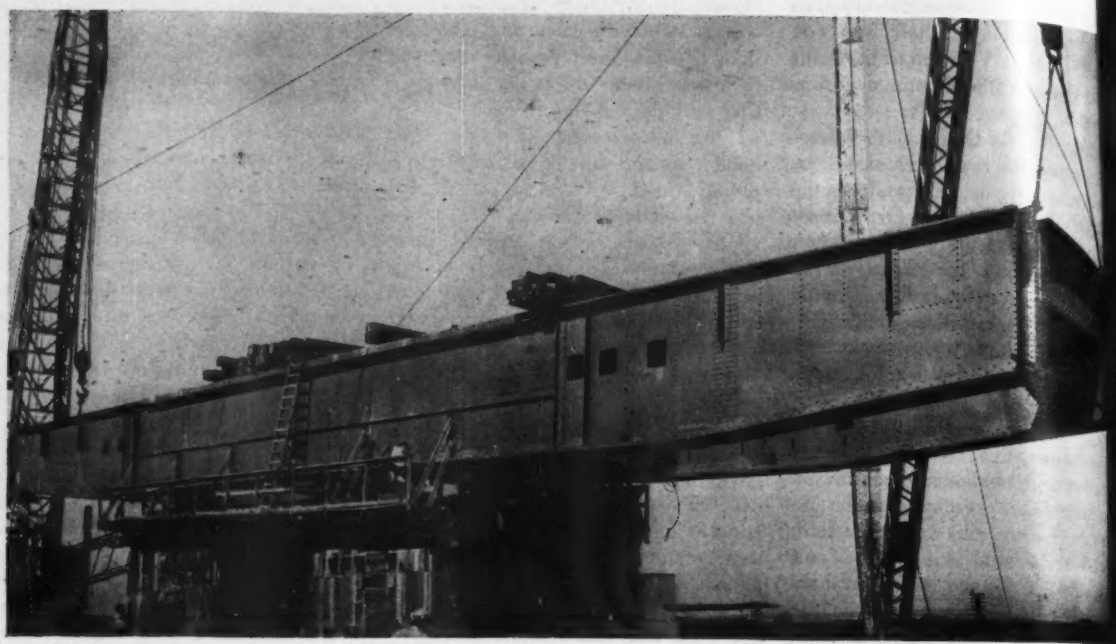


Fig. 1. Girders were raised to grade by building up two timber cribs as alternate ends of the members were lift

Turntable Car Used in Erecting Girders

TWO UNUSUALLY LARGE GIRDERS for a 250-ton outdoor powerhouse gantry crane at Kentucky Dam were raised 22 ft. and moved into position by the use of rockers and a turntable car. This scheme was adopted because all the equipment necessary was already on hand, having been employed on other TVA projects.

The girders, each of which weighed 100 tons, are 138 ft. long and 10 f deep. They span between two legs t ft. apart, overhanging 31 ft. upstrea and 38 ft. downstream. Because was considered best that all splic be made in the fabricating shop, t girders were delivered full lengt They arrived one at a time on thr railroad flat cars on a track paralle to the crane rails and a short distanc upstream from the point of erectio

The only hoisting equipment avai able for handling these pieces co sisted of one full revolving crane ha ing a capacity of 40 tons at a 40-f radius and one 50-ton guy derric Not only was the combined capacit of the two rigs insufficient to handl the load at the minimum workin radius, but it would have been im possible for the two rigs working i combination to shift the girders fro the cars to the final position in th structure, even though the weight ha been within allowable limits.

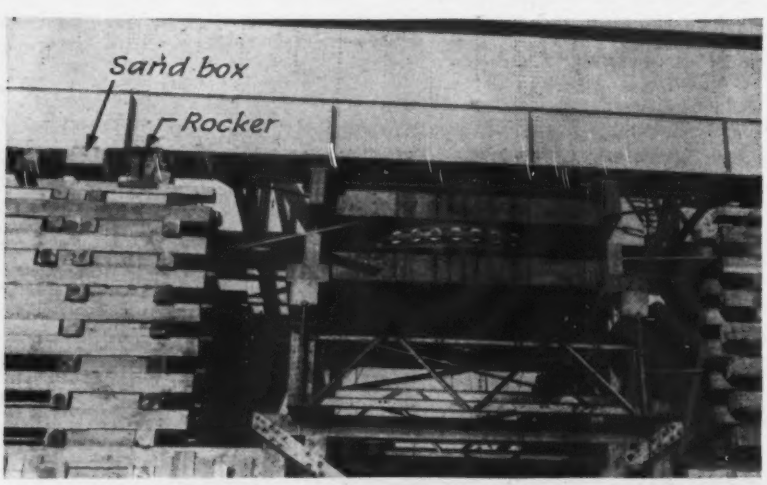


Fig. 2. When the girders were at sufficient elevation, they were lowered by sand boxes onto a turntable car operating on a temporary trestle between the cribs. Note the setback in the cribs to support the falsework trestle and to provide side clearance for rotating the upper turntable frame, also the rocker and sand box at left.

Girders first supported on cribs

A procedure that proved high successful was as follows: Upon a rival the girders were skidded off th

onto two low cribs 20 ft. square plan and spaced 17 ft. 6 in. to er side of the transverse centerline the girders. The girders were ced on the cribs in the same rela- position they would occupy in structure. Next they were joined the permanent end struts, and suf- nt additional temporary internal cing was installed to prevent end vement and distortion of the gird- during handling. Rockers were attached to the bottom flange of h girder 35 ft. on centers to bear the cribs.

With the rockers in place, either of the girder assembly, which weighed 220 tons, could be sed by a 40-ton lift. As alternate ds of the girders were raised, the bs were built up in increments of in. (two courses of timber) until assembly had been raised about ft. to grade (Fig. 1). At this point d boxes were inserted to support girders approximately 3 in. above de, the rockers being removed.

Steel falsework used

A steel falsework trestle with a 16- gage track (Fig. 2) previously had en erected on the centerline of the ne; this falsework was now ex- ded underneath the girders by ding a prefabricated section sup- rted on a setback of the cribs pro- ded for that purpose. The turntable r, which had been assembled in ce on the trestle, was then rolled der the girders and carefully posi- oned (Fig. 2). The car consisted of o similar 16-ft. square frame assem- ies, a lower assembly mounted on ucks and an upper frame rotating the roller circle between the frames d serving as a turntable. At each rner of the lower frame there were o 2-wheel trucks connected through equalizer beam to form one 4- heel truck. Forty-eight 8-in. dia. llers within a container ring were ed in the roller circle. The upper d lower rail circles consisted of 100- rail bent to a 8-ft. 3-in. radius.

Once the car was under the girder sembly two wedge jacks were added each corner of the upper frame and justed to a height of $\frac{3}{4}$ in. above al girder grade. The girder assem- y was then lowered to bear on the cks by permitting the sand to flow om the sand boxes. This operation as carefully controlled to insure iform distribution of load to the four corners until full load was transferred to the turntable car.

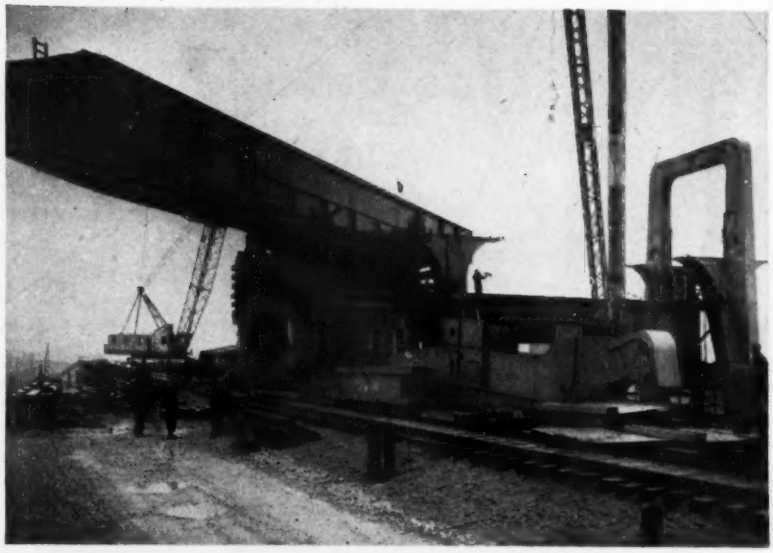


Fig. 3. Once supported on the turntable car, the girders were rotated through 90 deg. by means of a hand winch.

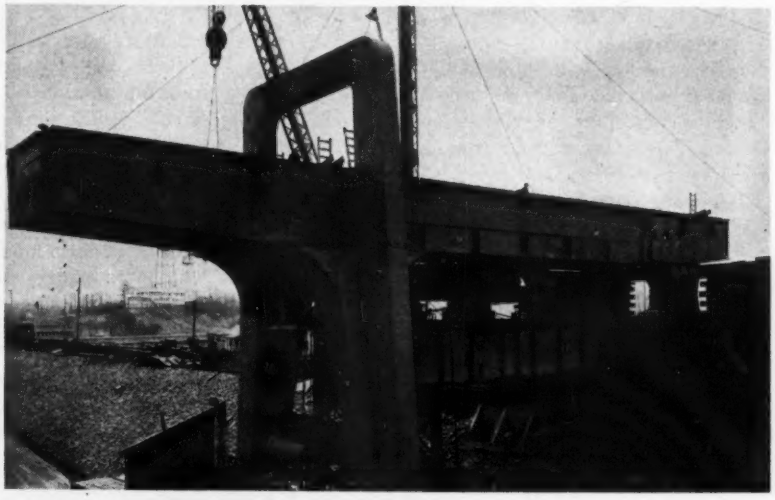


Fig. 4. After being rotated and moved downstream some 60 ft. on the turntable car, the upstream leg could be assembled and the girders lowered to permanent seat.

Next, the girder assembly was rotated 90 deg. and rolled about 60 ft. downstream to final position, the girders being threaded through the completed assembly of the downstream legs (Fig. 4). Rotation of girders and subsequent movement to position was accomplished by a hand winch reeved up with four parts of cable. This setup was selected to insure a more positive control of the operation than would have been possible with power equipment.

As the next operation, the upstream legs were assembled around the girders, plumbed up, bolted and aligned. Finally, the girders were lowered to the permanent seats by slacking off on the wedge jacks. Erection from this point proceeded in the conventional manner.

Kentucky Dam is being constructed by the Tennessee Valley Authority under the general direction of C. E. Blee, chief engineer, and A. L. Pauls, chief construction engineer. In direct charge of the work at the site is G. P. Jessup, project manager, with H. L. Broadfoot as construction engineer, and B. S. Philbrick, superintendent.

A New Type Bascule for Skewed Crossings

Clinton D. Hanover, Jr.
Chief of the Bureau of Bridge Design
Department of Public Works, New York City

***Contents in Brief**—Most movable bridges at skewed crossings being adaptations of types developed primarily for square crossings are uneconomical expedients. Taking the desirable features that are readily attainable in a right angle crossing as a criterion, the author developed a unique single span skew bridge distinguished by main girders that are "bent" at the channel line, forming forward and rearward arms of the leaf. Described as a "knee-girder bascule", the bridge provides a clear span equal to the channel width; piers that are parallel to the channel lines; and main girders that are parallel to the roadway in their forward portion and normal to the channel in their rearward portion. Loads on trunnions are equal, and the underfloor counterweight is as long as in a normal bascule.*

A SURVEY OF MOVABLE BRIDGES at skewed crossings will show that, for the most part, the structures used are merely adaptations of types developed primarily for normal crossings. They are expedients, and as such involve many compromises with an ideal solution of the problem. The author has long believed it was possible to design an efficient movable skewed bridge and when, in 1940, he was asked to prepare preliminary designs for a movable bridge at Hamilton Ave., over the Gowanus Canal in Brooklyn, N. Y., an opportunity was presented to test the belief. The canal intersects Hamilton Ave., at an angle of 56 deg., requiring a crossing skewed 34 deg. from the normal.

The resulting bridge, a twin single-leaf bascule, is entirely different from any previously built, and part of its success may be measured by the fact that it was built at a saving of more than $300,000 over the next most feasible layout. Two other bridges of the same type are now being designed as postwar projects for other locations in New York City.

Briefly described, the bridge might be called a "knee-girder bascule" in that the forward portions of the main girders (over the channel) are p allel to the centerline of the roadw while the rearward portions, wh carry the underfloor counterweig are at right angles to the centerline the stream (Fig. 1), rigid-knee joi at a obtuse angle connecting the f ward and rearward portions of t girders. Such an arrangement is improvement over the usual layout that it provides maximum room b tween the rear portions of the ma girders for the counterweight a operating machinery. Moreover, co bined with the correct method floorbeam framing, it places the ce ter of gravity of the counterweig near the centerline between the r portions of the main girders, so th the loads on the trunnions are equ or nearly so.

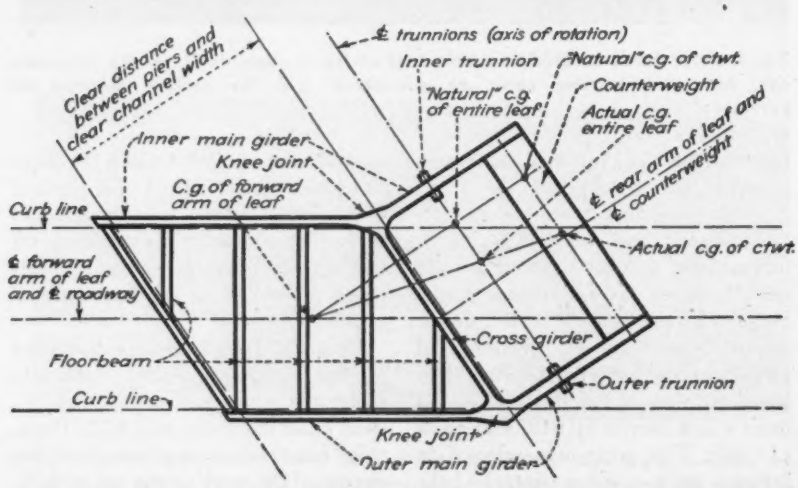


Fig. 1. Skewed bascule showing framing arrangement of main structural members of the new type bridge distinguished by forward and rear arms set at an angle to each other and connected by rigid-knee joints.

Disadvantages of usual bridges

Inasmuch as this design was d veloped to satisfy a set of ideal r quirements for skewed movab bridges, drawn up to overcome th disadvantages of the bridges co monly used, it may be well, first, t point out some of these disadvantage For example, a bridge type exte sively selected for skewed crossing has been a normal bascule bridg made sufficiently long to span th chanel without resorting to a skew all. Frequently this solution has re sulted in a clear distance betwee bascule piers more than twice th clear channel width, thus increasin the cost of the bridge enormously.

Often, too, in such a layout, a do ble-leaf bascule has been necessar where, if the clear distance betwe piers were made equal to the cle channel width, a single-leaf brid could have been used, requiring h one set of machinery and but one ma pier, with resulting economy both i first cost and maintenance. It may al be pointed out that a normal bridge a skewed crossing requires piers th are not parallel to the channel an

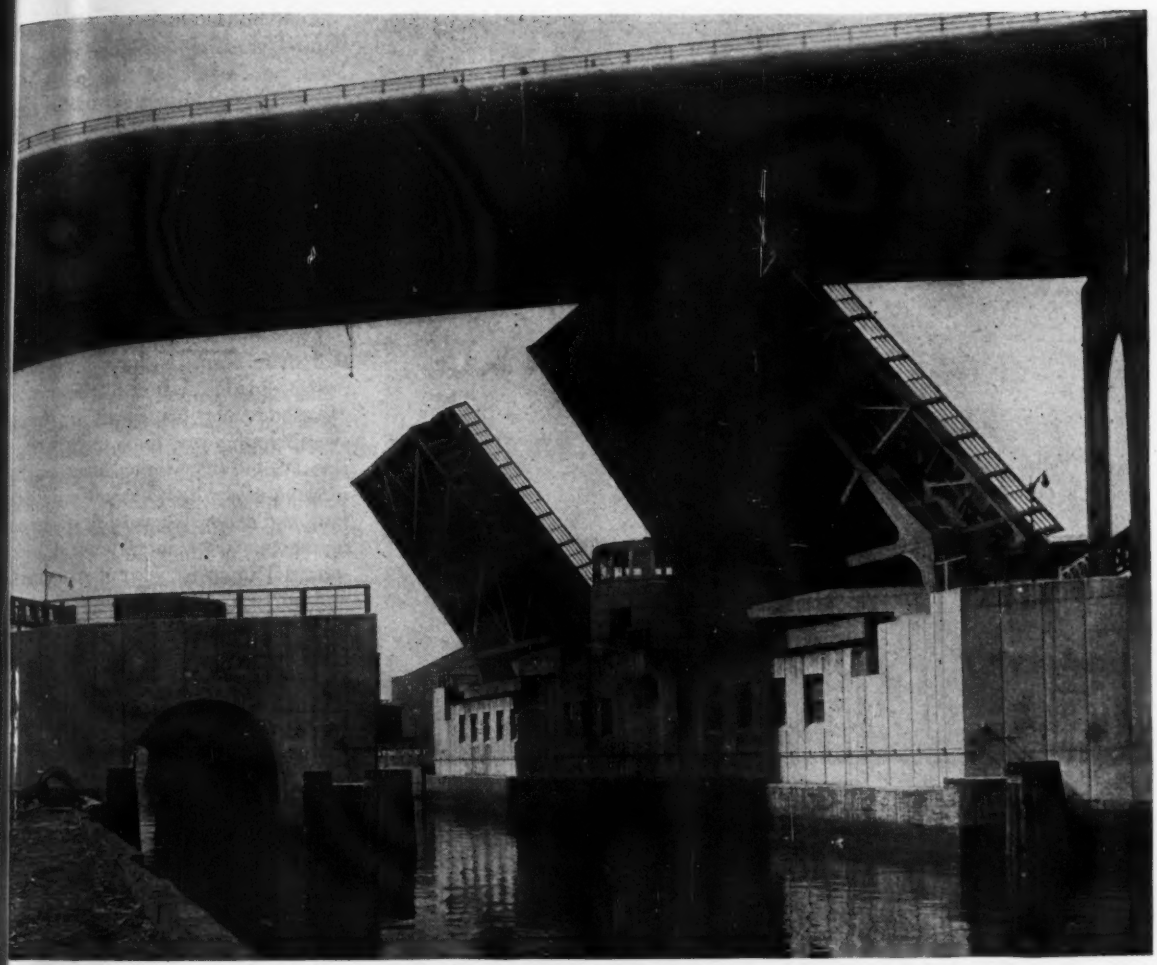


Fig. 2. New Knee-girder skewed bascule bridge on Hamilton Ave., Brooklyn, N. Y. The bridge consists of two separate single leaf bascule spans carrying two separate roadways.

which, therefore, reduce the cross sectional area of the channel, as well as producing eddy currents to interfere with navigation.

Vertical lifts have also been used for skewed crossings. If a normal, i.e., rectangular, lift span is used, its length must be greater than the clear channel width, thus increasing its cost and placing its piers at a skew with the direction of channel flow. If a skewed lift span is used, complications, and therefore extra cost, result in the framing of the towers, the counterweights and the span itself. And, finally, for short and medium spans, where high underclearance in the open position is required, the lift bridge is an unsightly, as well as an uneconomic, structure.

Perhaps the most frequently used structure for crossings of slight or moderate skew is a true skew bascule. Its deck is shaped as a parallelogram to fit the channel crossing precisely, but the main supporting bascule girders are placed normal to the channel lines and not parallel to the sides of the bridge (Fig. 3), a condition which requires that they be set rather close to each other. As a consequence, one main girder intersects the obtuse corner of the toe end of the deck and the other the obtuse corner of the heel end of the deck. Such an arrangement results in large triangular portions of the deck being cantilevered outside the main girders, with attendant flexibility in the leaf and unsightly appearance. The main girders, being placed closer together than the width of bridge really warrants, reduces the length of counterweight and, in most installations, the room for the operating machinery. The width and efficiency of the bracing system is also reduced. For very slight skews these inherent defects are not serious, but otherwise they vary from extremely serious to insurmountable. In cases of moderate skews double-leaf bridges are sometimes used for very short spans, but this doubles the number of main piers and the number of sets of machinery.

In addition to the use of bascules and lifts, skewed crossings have been effected by such outmoded types as swing spans and retractile draw spans. Even for normal crossing the swing bridge has several inherent disadvantages, such as the necessity of providing two openings in order to obtain one, and the presence of a heavy pier and pier fender in the middle of the stream, which sometimes interferes with docking facilities near the bridge and always is a source of danger for river traffic. These inherent disadvantages persist when a swing span is used for a skew crossing. Moreover, its length must be increased

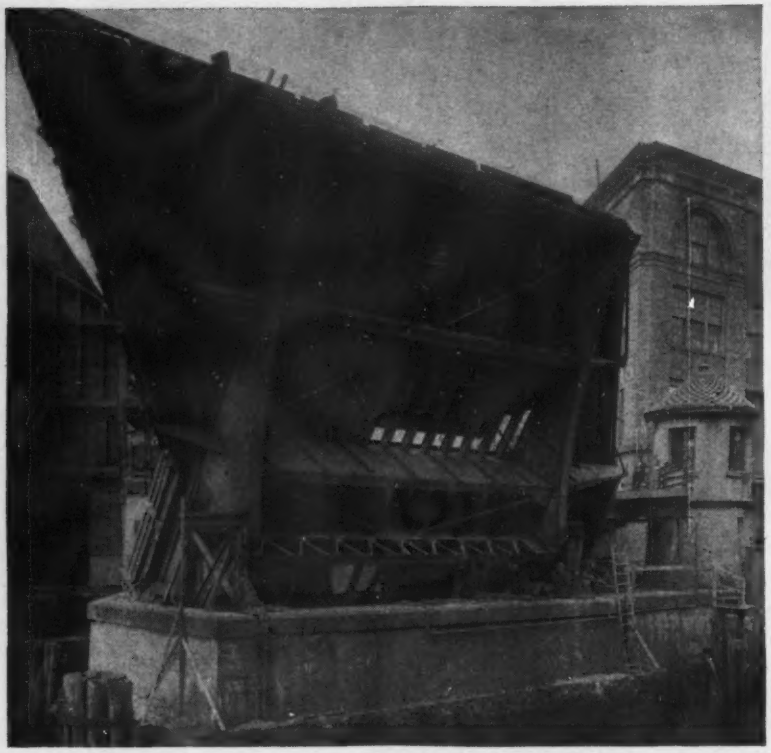


Fig. 3. Removing the old double-leaf Hamilton Ave. bridge, which was characterized by large triangular portions of the deck cantilevered outside the main girders, creating flexibility and difficult framing.

to accommodate the skew; in New York City, for example, there is a 250-ft. swing span at a skew crossing that provides only a 40-ft. clear channel.

The retractile draw bridge, few of which are still in existence, is in effect a horizontally moving platform, the greater part of which, as a rule, is located over land, with the smaller part cantilevering over the channel. It is opened by rolling back away from the channel. As a consequence, extra property is required to accommodate it in the open position, and adequate foundations must be provided for all of its positions, from fully closed to fully open. The numerous supporting trucks and their tracks are subject to heavy wear and high maintenance costs and, unless specially counterweighted, the moving span is more than twice as long as the width of the channel crossed.

Other types of movable bridges have been built and proposed for skewed crossings, but in the main, while ingenious, they might be considered as freaks. One ingenious type used at an extremely skewed crossing was similar to the skewed bascule type described above, except that both main girders were set off center of the deck to such an extent than an extra outboard bearing was required at the acute heel end corner of the deck. The center of gravity of the deck was almost over one main girder, requiring that the counterweight be arranged to load that girder very heavily while loading the other girder very little. As the entire counterweight is outside the limits of the roadway for this type, additional property is required. Another disadvantage is that the entire operating force is applied to only one girder.

A type that has been proposed, but not built, is a double-leaf bridge with triangular decks, the toe apex of each leaf resting on the far pier. The result is two single-leaf bridges, with two main piers and two sets of operating machinery, for a "single-leaf" crossing, with the resulting higher first and maintenance costs. The "toe" floorbreak between the two single leaves extends diagonally across the roadway from one side of the channel to the other.

Another method of solving the skewed channel crossing, which has been resorted to at times, has been to change the alignment of the roadway so that a normal crossing is obtained. This has resulted in dangerous reverse curves in the roadway alignment. This solution cannot be advocated in this day of heavy, fast traffic.

Requirements of ideal solution

From the foregoing it can be seen that there seems to have been in the past no ideal solution to the problem of a movable bridge at a channel crossing of more than a very slight skew. Solutions adopted have resulted in structures which basically were too long and expensive as to first cost and maintenance, or in structures which were not sufficiently rigid structurally and so were unsatisfactory in operation and had high maintenance costs.

The ideal movable bridge for a skewed channel crossing should have the following features:

1. The clear span should not be greater than the clear channel width.
2. The effective span length should be the shortest possible.
3. The piers should be parallel to the channel lines in order to disturb the channel flow a minimum amount.
4. The main supporting girders or trusses should be parallel to the roadway and separated as far as possible for the sake of structural rigidity and for economy in maintenance.
5. The main supporting girders or trusses should also be normal to the channel so that the trunnions or supporting axles may be parallel to and close to the channel lines.
6. The number of skewed structural connections should be a minimum in order to provide simple and relatively inexpensive framing.
7. The main lateral bracing system should extend over the full width of the bridge.
8. The length of the counterweight should be nearly as great as the width of the bridge so that ordinary concrete can be used instead of heavier and more expensive materials.
9. The loads on the two girders or trusses should be such that

the counterweight can have nearly equal reactions on the main supporting members and so that the trunnion reactions will be nearly equal, allowing equal operating forces to be applied to the main girders without tending to rack the span.

10. Adequate room for the machinery on the leaf or on the pier between the main girders should be provided.

11. The bridge should present a pleasing appearance.

These "ideal" requirements for a skew bridge are practically a description of the best normal bascule bridge at a normal crossing. In developing the new skew bridge the author retained all the good features of a normal bascule with the minimum variation in framing demanded by the necessary skew. The same principles of design were used throughout, all members being subject only to simple shear, moment, and direct stress, and none subject to torsional stresses.

Development of the new design

Several layouts for a new bridge at Hamilton Ave. were studied, among them a double-leaf skew bridge of the same type as the old one (Fig. 3), and a double-leaf bridge without skew. These schemes were the most feasible that were investigated, but they had the fundamental disadvantages before outlined for each type, and they were both necessarily double-leaf layouts where a single-leaf layout, if one could be devised, was most emphatically indicated.

Adhering to the list of requirements of the "ideal" bridge at a skew crossing, a tentative layout of a single-leaf bascule was made, which satisfied in general the first eight of these requirements. The layout amounted to a normal single-leaf bascule span, in which the main girders were "bent" at rigid knee-joints as shown in Fig. 1. The arrangement provided a clear span equal to but not greater than the channel width; an effective span that was the shortest possible; piers that were parallel to the channel lines; and main girders that were parallel to the roadway and also normal to the channel lines, as well as being spread apart sufficiently that the number of skewed connections could be kept low, lateral bracing extended the full width of bridge, and the counterweight made as long as in a normal bascule. The design problem now became one of balance and of stresses.

Referring to Fig. 1, which is a simplified layout of the structural framing of the bascule leaf of the Hamilton Ave. bridge, it is apparent that the center of gravity of the forward arm of the leaf is laterally much nearer to the inner rear girder and trunnion than to the outer rear girder and trunnion. Under ordinary circumstances this fact would require that the center of gravity of the counterweight should also be much nearer the inner girder, on a line drawn through the center of gravity of the forward arm and normal to the center line of the trunnions. This would result in extremely heavy loads on the inner trunnion, as well as in nullifying the advantage of the long space for the counterweight. If the center of gravity of the counterweight were arbitrarily placed at its center line there would be a resulting racking and warping of the entire span, with torsional stresses and strains in the main girders, a thoroughly undesirable structural condition.

This undesirable circumstance of loading one trunnion heavily and having an irregular counterweight, or of producing span warping and torsional stresses, was overcome by the simple expedient of framing each floorbeam of the forward arm farther out on the outer girder than it is framed out on the inner girder. Besides making the entire scheme feasible, allowing the use of a uniform counterweight, making the trunnion reactions equal or nearly equal, eliminating all torsion, and warping, the floorbeam framing is itself made at right angles, thus eliminating all but the absolutely minimum number of skewed connections.

An essential part of the framing is the cross girder between the rigid knee-joints of the main girders. This girder, of the same depth as the main girders at the joints, provides the equilibrium of forces at the knee-joints, and also acts as the heel floorbeam and the rear floorbreak sup-

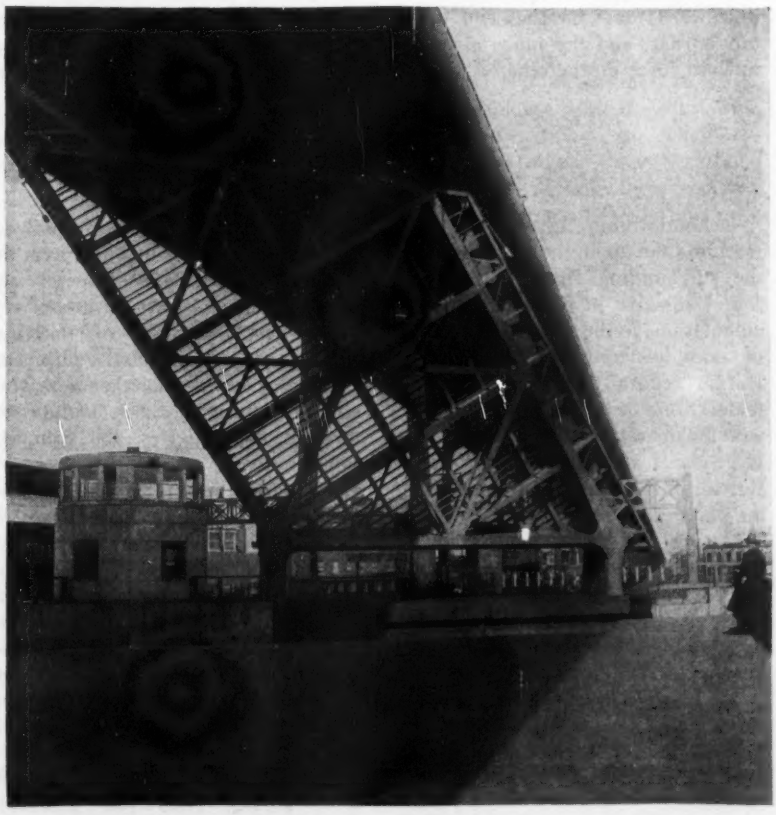


Fig. 4. With the span in position the "knee-girder" detail of the new Hamilton Ave. bridge is plainly visible, as is the right-angle framing of the floorbeams into the main girders.

port. The framing of the knee-joints is comparable to the framing of joints in a truss. All other connections of girders, crossbeam, floorbeams, and counterweight frames are simple shear connections.

General analysis of structural action

The analysis of the forces in the members of the structure may be understood by referring to Fig. 1. The crossgirder carries moments induced in it by the tension and compression forces in the flanges of the main girders at the knee-joints. The angular relation of the forward and rear portions of the main girders at the knee-joints being in the same general sense or direction, these induced moments in the crossgirder are of the same sign and are therefore additive. The sum of these induced moments is equal to the moment of the forward arm about the center line of the rear arm, and is independent of the manner of framing the floorbeams.

To maintain equilibrium in the crossgirder it, therefore, follows that the outer girder must exert a downward force on that end of the crossgirder, and the inner girder an upward force on the other end of the crossgirder. As every force requires an equal and opposite reaction, the crossgirder must, therefore, exert an upward force on the outer girder at its knee-joint and a downward force on the inner girder at its knee-joint. It is these two forces on the respective main girders that give the "natural" tendency for the inner trunnion to be more heavily loaded than the outer trunnion, and which tend to locate the center of gravity of the counterweight, and therefore that of the whole span, near to the inner girder.

This "natural" and constant tendency of the crossgirder to locate the center of gravity of the counterweight nearer the inner girder can be counteracted at will by varying the method of framing the floorbeams into the main girders. By framing each of these floorbeams into the outer girder farther from its knee-joint than it is framed into the inner girder from its knee-joint, the moment in the outer girder is increased and the moment in the inner girder is decreased an equal amount, while shears in the main girders remain unchanged. This shifting of moment from the inner to the outer girder requires that, for balancing each of the main girders about its trunnion, the center of gravity of the counterweight must be shifted toward the outer rear girder, thus placing the center of gravity of the counterweight at or near its center line, and making the trunnion loads equal or nearly equal, depending upon the general dimensions of the span and the relation of the floorbeams to the main girder knee-joints.

The new design provides a structurally sound and highly economical solution for highway and railway movable bridges at skew crossings. Economy may be considered inherent in the design as the bridge "fits the crossing precisely."

All preliminary studies for the new Hamilton Ave. bridge were made by the Department of Public Works, Irving V. A. Huie, Commissioner, under the supervision of the author. The selection of the type used was made by Waddell & Hardesty, consulting engineers of New York City, who prepared the final plans and specifications for the Park Department, Robert Moses, Commissioner, under whose jurisdiction the construction of the low level bascule span and the express highway immediately above was coordinated. The author has been granted a United States patent on the new bridge.

Refrigeration Aids Slime Control

Dehumidifying by cooling then warming the air to the temperature of the surrounding structure has been found effective in reducing slime accumulations in the inspection galleries of mass concrete structures. S. O. Harper reports this new use for refrigeration, developed in connection with the operation and maintenance of large dams and power plants of the Bureau of Reclamation of which he is the chief engineer.

During the humid season of the year, the normal temperatures of the galleries and of mechanical and electrical equipment within the dams are appreciably below the dew point temperature of the outside air. This leads to the condensation of moisture from air entering the galleries and its deposit upon the walls of the galleries and the mechanical and electrical equipment.

Moisture accelerates the growth of microscopic organisms and the formation of slime upon the walls of the galleries and causes the rapid deterioration of the paint films with the consequent corrosion of metal surfaces. Also, moisture permeates and causes the breakdown of electrical insulation on wiring and equipment.

Since it is essential that a reasonable movement of air be maintained through the galleries, the complete solution to the problem of moisture condensation lies in the dehumidification of the ventilating air before it is introduced into the galleries.

One installation of equipment for this purpose is in progress at the Marshall Ford Dam in Texas, and a second is projected for the Grand Coulee Dam in Washington. The equipment is designed to perform the following functions:

(a) Filter the outside air.

(b) Precool the air in extended-surface coils with reservoir water. Some moisture is removed from the air by condensation in these coils.

(c) Subcool the air in extended-surface coils with water chilled by mechanical refrigeration. Additional moisture is removed from the air by condensation in these coils.

(d) Reheat the air to normal gallery temperatures in extended-surface coils with water warmed by heat rejected to the refrigerant condenser.

(e) Direct the processed air through the galleries in a predetermined path. This is accomplished by means of a centrifugal blower and a system of bulkheads in the galleries.

Due to wartime restrictions, the dehumidifying and ventilating apparatus will be installed and operated without the mechanical refrigeration equipment. However, provision is made in the design for the addition of this equipment when it becomes available.

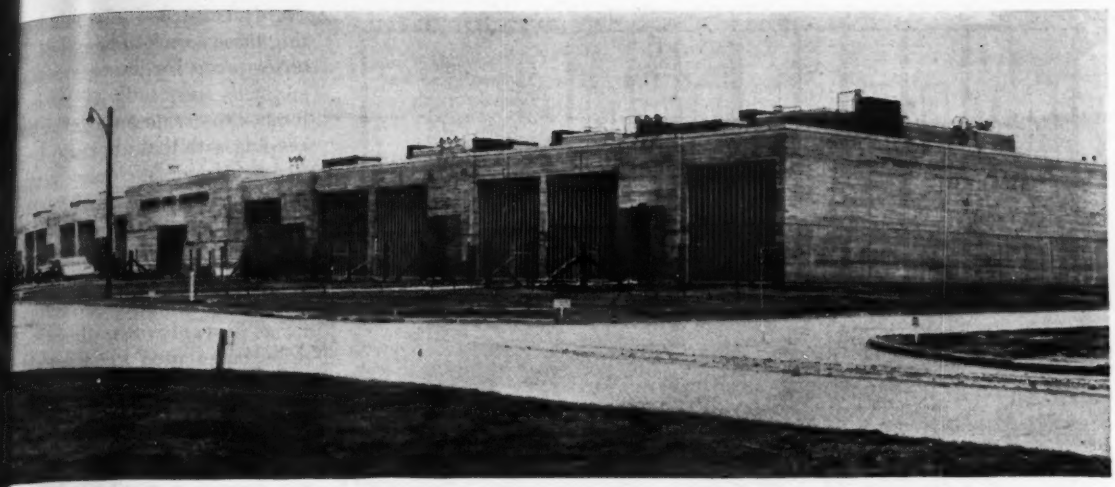


Fig. 1. Six test cells of 20-ft. throat diameter are provided at each side of a central inspection and repair room.

A Pioneer Engine Test Building

***tents in Brief**—Airplane engine test cells 95 ft. long and of 20-ft. at diameter were built of concrete, heavily reinforced. Construction of interior forms presented a difficult problem. The solution was found by ding the throat section of the forms on a timber work platform and ing it in place as a unit with a crane. To reduce vibrations, foundations e carried to rock, and footings for engine mounts were insulated from t of structure. Noise generated by test engines is controlled by sound orbing baffles and insulation.*

AIRPLANE ENGINE TEST BUILDING Midwest Army airbase is notable he unique structural layout of the lities and for the difficult con- ction occasioned by extensive use reinforced concrete that necessi- l large and complicated formwork. requirements to eliminate vibra- were also of more than ordinary rest.

uilt to permit accurate, simul- eous testing of twelve large air- e engines, the structure (Fig. 1) sures 95x437 ft. in plan. A 75x95- one-story center section provides rge inspection room on the ground r and an equipment room in the ement. At either side of this sec- are three pairs of test cells 95 ft. and of 20-ft. throat diameter. h pair of cells is separated by a t. width of three-story-with-base- nt construction housing the con- , machinery and utility rooms g. 2).

he major part of the building is of concrete construction, heavily reinforced—16,000 cu.yd. of concrete requiring 533 tons of reinforcing steel. An exception is the roof framing for the central section of the structure where steel trusses were considered more satisfactory because of the large spans involved.

Cell construction creates problem

Construction of neither the central portion of the building nor of the rooms between the cells caused any difficulty, but the cells themselves, because of the variation of their size inside from 20-ft. diameter at the throat to 20 ft. square at the ends, presented a complicated problem. The floor of the cells is 18 in. thick, as is the flat slab roof, while the walls vary in thickness from 18 to 24 in. The walls and roof are double reinforced. Each layer for the former consists of $\frac{3}{4}$-in. dia. bars on a 6-in. spacing both ways, and each layer for the roof called for $\frac{3}{8}$-in. longitudinal bars on 18-in. centers and $\frac{3}{8}$-in. transverse bars on a 3-in. spacing.

A 10x10-ft. tunnel passing beneath the cells and through the basement of the other portions of the structure, permits delivery of engines to the cells. Hydraulic-operated lifts of 3-ton capacity deliver the engines from the tunnel to the shops between the cells, entrance from these rooms to the cell being provided by swinging steel doors of rigid construction. In front of the test stand in each cell is a hydraulic lift that is available to aid in the installation and removal of enginers from the test stand.

General procedure was to construct two neighboring cells simultaneously. In building a pair of cells, the floors and the lower half of the two outer walls and the intermediate wall were poured in one operation, next the upper half of the walls, and finally the roof. This method resulted in two horizontal construction joints in each wall, one at mid-height and one just below roof level, no joint being used at floor level. Vertical control joints were added at 60-ft. centers.

Throat forms built as unit

Because of the variation of the inside shape of the cells from a square at the ends to a circle at the throat, construction of the interior forms presented the major problem. The

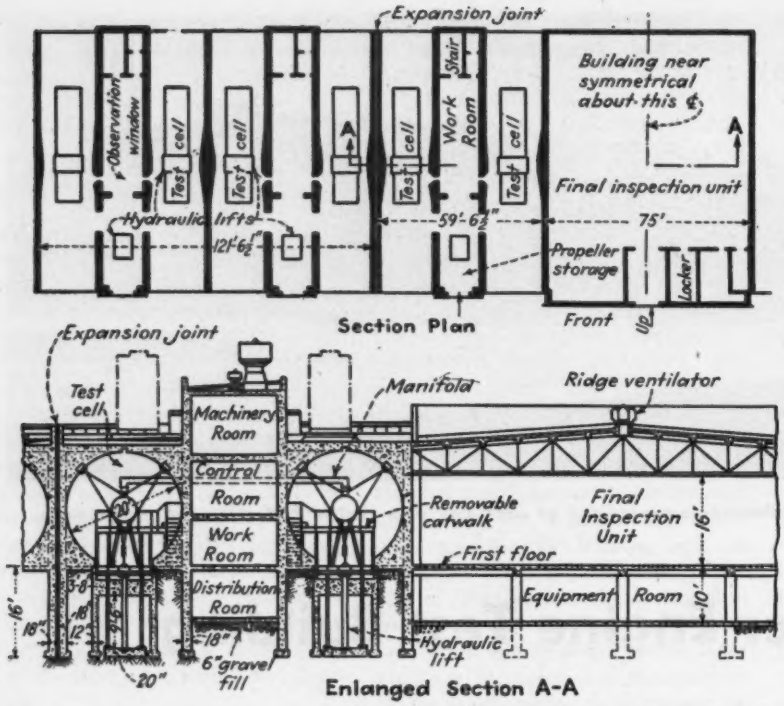


Fig. 2. Most of structure is heavily reinforced-concrete construction, but steel roof trusses were used for final inspection room. To reduce vibration, foundations were carried to rock and footings for engine test stands were isolated from rest of structure.

highly successful method finally adopted in constructing these forms was as follows: First, a temporary timber working platform about 24x40 ft. in plan was built. On this, the form for the uniform-diameter section, which is 6 ft. long, was constructed while lying flat and then set on edge (Fig. 3). Next, the tapered end sections, constructed while resting on their large ends, were up-ended and joined to the cylindrical section. Finally, the entire form for the throat, now 38 ft. long, was picked up by a crawler crane with a 115-ft. boom and moved over to the desired location.

The interior forms were constructed of T & G 1x6-in. lumber nailed over 2x4-in. studs on a 12-in. spacing. Sturdy construction resulted, pe
ting these forms to b reused. Th
terior forms for the ter walls
end cells were built f 1x6-in.
lumber to create an exterior fini
keeping with that of nearby build

A concrete developing a mini
compressive strength of 3,000 p
28 days and delivered with a
slump or less was used throug
Manufactured by truck-mounted
ers, the concrete was delivered t
forms by rubber-tired buggies, t
skips being used to elevate the
crete to the desired level. Contin
pours as large as 1,000 cu.yd., w
required placing operations to
tinue for 23 hr., were necessary.
the concrete was vibrated in pla

Test stands on insulated footi

To reduce the vibration caus
operation of the test engines at
speed, three measures were ta
(1) The footings for the cell
were carried to rock; (2) the
stands were supported on indepen
footings also carried to rock
isolated from the rest of the struc
by a ½-in. layer of asphalt insulat
and (3) two vertical expansion j
were added to divide the structure
three sections, each end section
sisting of two pairs of two cells
their common control rooms and
shops.

Two measures taken to reduce
intense noise created by the eng
being tested were: (1) The first 2
at either end of each cell was g
over to 4-in. thick vertical sound
sorbing baffles on a 16-in. spa

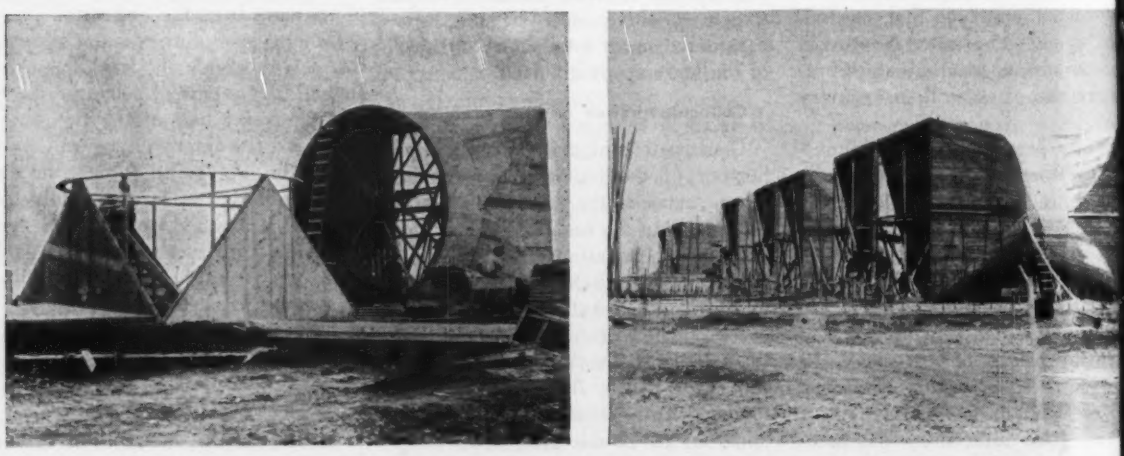


Fig. 3. Left: Assembling interior form for throat section of a test cell on a work platform. Completed unit was moved to place with a crawler crane. Right: Throat section forms of seven cells ready for erection of remainder of interior fo and exterior forms for lower half of walls. General procedure was to place concrete simultaneously for two neigh ing cells, the walls and roofs being heavily reinforced.

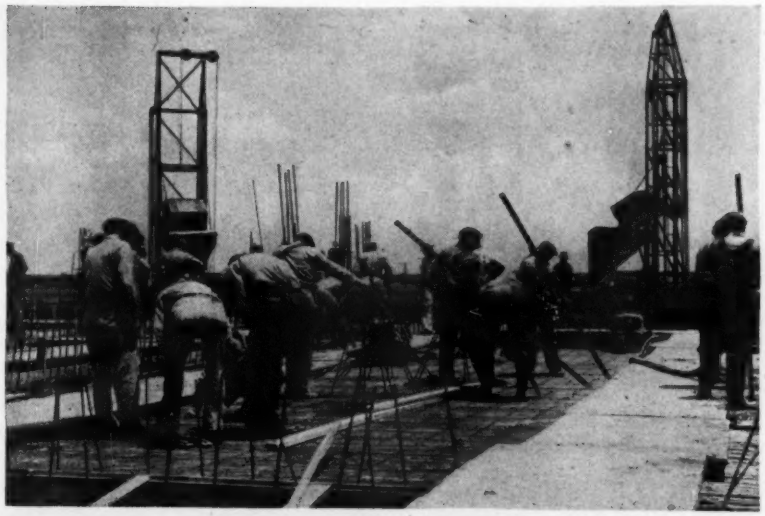
(2) the walls and ceiling of the
ol and operating rooms between
ells were covered with a 2-in.
sound-absorption insulation.
e vertical baffles are of the ordi-
type, consisting of a steel frame
ed on each side with 18-gage
rated steel sheets and having the
rmediate space filled with glass

dependent and accurate control
ach test engine under a wide
e of conditions is possible. The
ilable facilities permit the follow-
to be controlled and measured:
consumption, temperature of the
consumption and temperature of
air supply for the carburetors,
d of operation, and the power
ut from each engine. Operation
e engines under a wide range of
itions requires a total of 120
per hour refrigeration capacity,
20-ton capacity units being in-
ed in the basement of the main
ion of the building. Near the re-
eration room a transformer also
installed to reduce the electrical
ply from 4,160 volts to 110-220
s.

Construction requires 18 months

Construction required 18 months,
contractor employing a crew of
to 275 men. The work, which cost
500,000, was done by the Tulsa
trict, U. S. Engineers, Col. E. J.
son, district engineer, Lt. Col. D.
Grosshans, chief of the engineering
ision, F. C. Franzen, head of the
ign branch, and Maj. P. F. Good-
n, area engineer.

Dunning, James & Patterson, Ok-
oma City, was the general contrac-
J. Gordon Turnbull, Cleveland,
Sverrup & Parcel, St. Louis,
e the architect-engineers.



4. Top: Concrete for roof of cells delivered by tilting elevator skips distributed by rubber-tired bug-

ter: A completed stand ready for allation of test engineer. Note nd-absorbing baffles in background.

tom: To provide necessary services each test cell, numerous conduits e suspended from ceiling of tunnel ning under building.

Fig. 1. Power for pulling the pipes i place was supplied by a steel c leading from a crawler crane on launching side to a six-part hitch the far side.

Double Sewer Siphon Pulled into Place

A PROCEDURE new to sewer construction practice at Bridgeport, Conn., was used recently when two 24-in. dia. cast iron pipes for a double siphon across a tidal stream in that city were pulled into place. The work was so successful that use of the same method is being considered for construction of a longer siphon requiring larger p

The double siphon is part of a in. dia. sewer, two pipes being used that one can be repaired or clea while the other carries the flow. T pipes are 240 ft. long, and they spaced 5 ft. c. to c.

At the center of the stream the quired cover over the pipe was ab 12 ft., the top of the line being roug the same distance below mean l water. The trench for the two lines excavated with a drag bucket hand by a crawler crane operating from west side, an overhead line being u to return the bucket to the east side the stream.

Firm sand was encountered for o half the crossing and muck or hard clay for the remaining distance. cause of this variation, the trench excavated to full depth in the fi sand, but was left about 1 ft. hi where muck was encountered, so settlement of the line in this area ing expected. In the final preparati of the trench, which was about 8 wide and of 16-ft. maximum depth timber plank fastened across t mouth of the dragline bucket serv as a huge trowel and thus helped shape a smooth bottom.

Delivered in 12-ft. sections, the p was assembled in 36-ft. lengths p liminary to the pulling operation. T procedure reduced by two-thirds t number of joints to be made once t work of dragging the lines into po

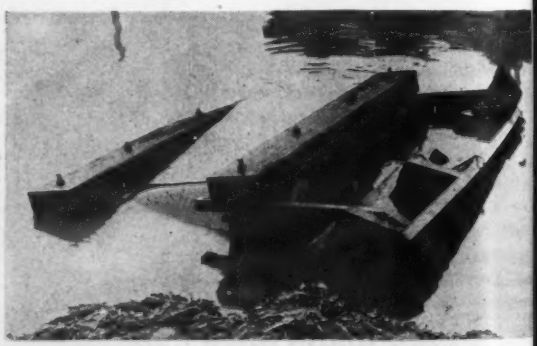


Fig. 2. During the moving operation the outer ends of the pipe were supported on a timber toboggan that provided firm hitch to move both pipes simultaneously and aided in making lines buoyant. Pipes were plugged and empty dr were attached to the pipe to provide added buoyancy.

3. When in final position both lines were tested with compressed air as well as under hydrostatic pressure. The ching cradle, shown in this picture, was of sturdy timber construction and about 40 ft. long.

was begun. A standard flexible caulked with lead was used to the sections. Pneumatic tampers employed to caulk the lead.

40-ft. timber launching cradle constructed on the west side to vide a convenient place for con- ting the 36-ft. sections as pulling gressed. For the first 24 ft. beyond cradle timber planks 3 in. thick added to prevent the pipes from ging into the river bottom.

oth pipes were moved into place in same operation. The outer ends, ich were tied to a timber toboggan he type illustrated by Fig. 2, were gged. These plugs reduced the ef- tive weight of the pipe, and thus re- ed the force required to pull the s into place. Further buoyancy of pipe was provided by three pairs two 50-gal. drums.

Crawler crane supplies power

Power for pulling the pipes across stream was supplied by a crawler ne through a six-part line tied to a dman 200 to 300 ft. from shore on far side. The pulling operation s completed in one day. As each 36- section was added, the crane raised free end of the new section a few t to insure flexibility of the joints or to installation.

Once in place, the lines were tested h an air pressure of 40 psi. A few nts in one line were found to leak, d a diver was employed to recaulk those joints. Next the lines were tested with a hydrostatic pressure of 40 psi. The specifications stated that if leakage greater than 94 gal. per joint per 24 hr. occurred, all faulty joints were to be repaired. Fortunately, little leakage was noted, and no additional joints had to be recaulked.

Soundings taken after the crossings had been in place a few days indicated that the pipe had not settled in the muck as much as was expected. As a result the pipes were a little over a foot high at one point. Material below the pipe at this location was removed by a diver, using compressed air and water.

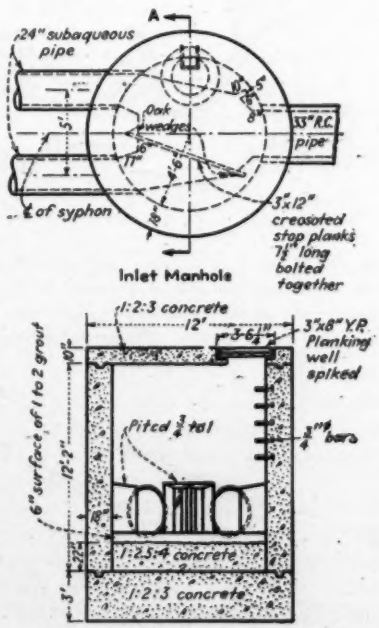


Fig. 4. Manholes for siphon, of 9-ft. diameter, were built with plain concrete walls because of reinforcing steel shortage. Both manholes were equipped with stop planks permitting flow in either pipe to be eliminated.

Manhole at each end

At both ends of the crossing a manhole of plain concrete was constructed (Fig. 4). The floors for the manholes were built before the pipe was pulled into place, the walls and top being added afterward. Creosoted timber stop planks were placed in the manholes to permit the flow to be diverted to either pipe.

The work was done by the city of Bridgeport, Henry L. Rowland, city engineer, and C. E. Smith, resident engineer. H. K. Gatley, Maplewood, N. J., was consultant for the work. The Federal Works Agency, which supplied 50 percent of the funds for construction, was represented by James A. McConnell, assistant regional director at Boston, and Christopher R. Chisholm as construction resident engineer.

Spearin, Preston & Burrows, New York, was the general contractor. For this firm Howard DePew, superintendent, was in general charge.

Overseas Highway Shortened by 17 Mile

***Contents in Brief**—The Overseas Highway to Key West, Fla., has been shortened 17 miles by reconstruction of 91 miles of an abandoned railway as a paved highway. Ties and rails of old bridges were replaced with a concrete deck overhanging 6 to 7 ft. each side and providing a 22-ft. clear roadway. Four new bridges, including one bascule, were built. Between bridges an 8-in. two-course bituminous surface treated pavement 22 ft. wide was put down. It was built of oolitic limestone and Key limerock obtained for the most part from underwater quarries located along the road on about 5-mi. intervals.*

FOLLOWING TWO YEARS OF WORK a greatly improved highway from the Florida mainland to Key West, and shorter by 17 miles than the route formerly used, was dedicated May 16 and opened to traffic for its full length of 123 miles. Economy and the possibility for obtaining a greatly improved alignment dictated that for the most part the new highway follow the right-of-way of the abandoned Florida East Coast Ry., which stopped operating after the 1935 hurricane. This plan required improvement of 91 miles of railroad right-of-way, and included modification of 19 railway bridges to highway structures and construction of four new crossings. In addition to the type of struction required, the project i interest in that war conditions res in much of the work being don the Florida State Road Departmen force account.

Known as the Overseas High the road starts at Florida City an tends over a series of low island the city of Key West on the islan that name. In 1936 and 1937 Overseas Road and Toll Bridge trict improved 32 miles of the railroad bed as a toll highway. work was made up of a 14.8-mile tion from Lower Matecumbe Ke Grassy Key and a 17.3-mile sec nearer Key West (Fig. 1). The l project included modification of bridge 7 miles long (*ENR*, Sept 1937, p. 388), which is believed t

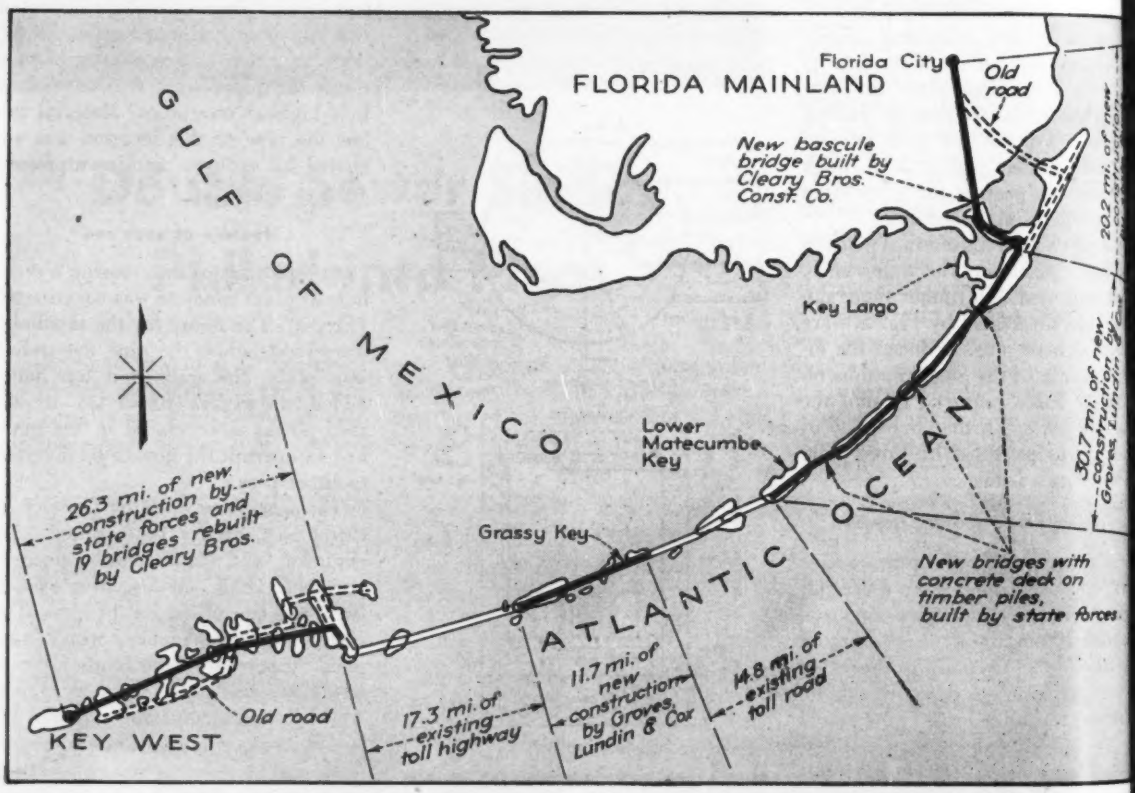
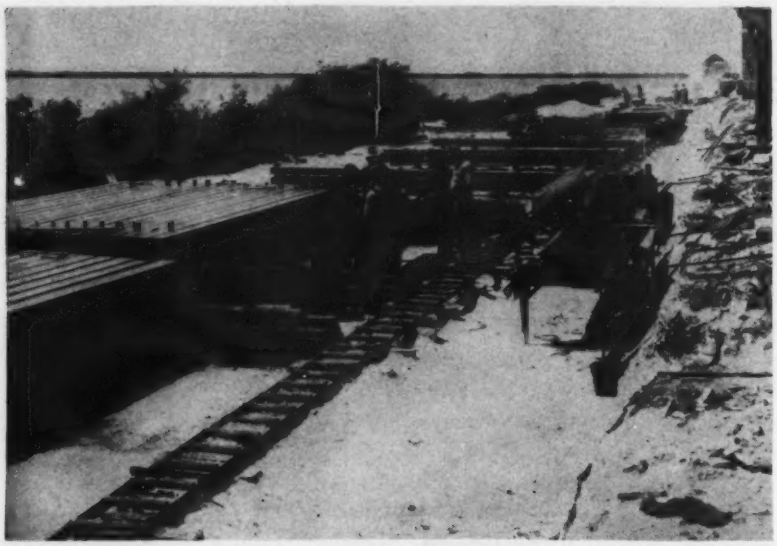

FLORIDA MAINLAND
Florida City
Old road
New bascule bridge built by Cleary Bros. Const. Co.
GULF OF MEXICO
Key Largo
Lower Matecumbe Key
Grassy Key
ATLANTIC OCEAN
26.3 mi. of new construction by state forces and 19 bridges rebuilt by Cleary Bros.
New bridges with concrete deck on timber piles, built by state forces.
Old road
KEY WEST
17.3 mi. of existing toll highway
11.7 mi. of new construction by Groves, Lundin & Cox
14.8 mi. of existing toll road

Fig. 1. In 1938 slightly over 32 miles of the Overseas Highway to Key West was replaced by a toll road built along abandoned right-of-way of the Florida East Coast Ry. The remaining sections, which consisted of old timber bridges narrow roads over the islands, now have been replaced by a new highway built along additional sections of the aboned railroad right-of-way. This work, much of which was by force account, totals 91 miles and shortens the distbetween Florida City and Key West by 17 miles.



Kelcy photo

Fig. 4. Extensive work was done to protect beams used to widen deck of bridges from salt-water spray, the operations being carried out at a central yard on the job. After the beams had been cleaned by sandblasting (right background), the ends that were to overhang were painted with coats of a special primer and black enamel. The middle sections were covered with three coats of asphaltic paint and two alternative layers of bituminous impregnated fabric (center).

all surface moisture. The beams next moved on a conveyor to the waterproofing benches.

On these benches the section of each member that was to be embedded in the old structure was given three coats of asphalt and two alternate layers of asphalt impregnated fabric and the exposed ends another coat of the primer. Following a few days to allow the paint to dry, the beams were transported to the bridge and placed in the structure by a traveling crane rigged specially for the job. Finally, the overhanging ends were given two coats of black enamel. In all handling operations great care was taken to eliminate fracture of the waterproofing fabric.

In placing the beams in the structure they were set on three layers of canvas and red lead in notches cut in the spandrel walls. Later the cuts were closed with concrete to anchor the beams in place.

For construction of the deck slab, a concrete designed for a compres strength of 2,800 psi. at 7 days 4,000 psi. at 28 days was used. Co aggregate for the concrete work crushed Key limerock obtained fr a pit at Big Time Key, Fla. This ma rial and ordinary portland cem were mixed with seawater.

General procedure was to build short length of the overhang al one side of the deck, working from top of the old fill over the arches, then to construct the cantilever at other side. This method resulted a closely balanced loading of supporting stringers.

The concrete was manufactur with a paver moving ahead over rockfill as work advanced, materi being delivered by trucks operati along the central fill, and the concr being placed directly in the forms the paver. As a last operation the c ter closing strip, about 11 ft. wi was constructed with concrete del ered by the paver as it traveled ba across the bridge. The inner edges the cantilever sections were tied to t spandrel walls by ¾-in. bolts on 5 centers. Transverse expansion joi were provided above every seco beam, on or about 21-ft. centers, a dummy joints at all other beams.

As a final operation in constru ing the deck, the exposed underside the roadway slab was given a coat water-gas tar paint. Later, after th paint had dried, a coat of liqui asphalt was applied.

Drainage from the deck is provid by 4-in. holes in the slab along bo

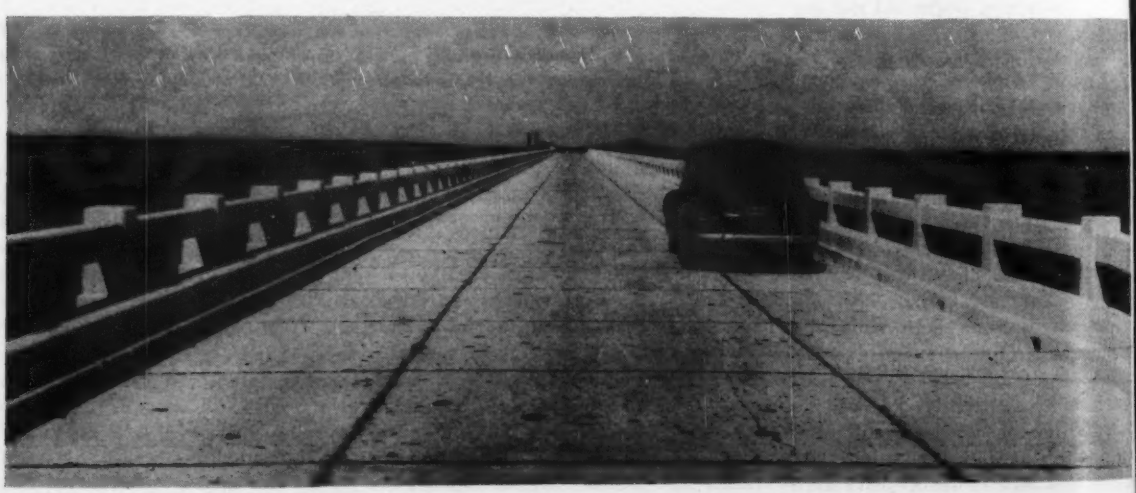


Fig. 5. Reconstructed deck of a typical bridge provides a 22-ft. clear roadway. In constructing the new deck the overhangs were built first and then the center section was paved. Note double-step design of curb and single rail, the horizontal members of the latter being precast and the post cast in place.

edges of the roadway. These holes are located between the steel I-beams supporting the overhangs.

Starting on the mainland and traveling toward Key West the first new structure encountered is an electrically operated double-leaf bascule of 100-ft. span carrying the highway across Jewfish Creek, which separates the mainland and the first island.

This crossing has an overall length of 225 ft. and provides a 26-ft. roadway designed for an H-20 loading. Its piers are founded on rock. Construction proved difficult only from the standpoint of critical materials. This made it necessary to build the deck of treated timber, which will be replaced later with an open steel flooring. All exposed structural steel was protected by one shop coat of red-lead paint, plus two field coats of black-graphite paint. Inner and outer faces of the pier walls were given five coats of water-gas tar, plus one coat of fluxed refined tar for a seal coat.

Three other new bridges consisted of treated timber pile bents carrying 24-ft. wide reinforced-concrete decks designed for an H-20 loading. In constructing the pile bents for these structures it was found necessary to punch holes in the underlying rock to provide sufficient penetration of the piles. This work was done with a heavy punch, handled by the floating pile-driving rig, consisting of two railroad rails welded together and ending in a heavy 10-in. dia. steel point.

Grading operations along the many

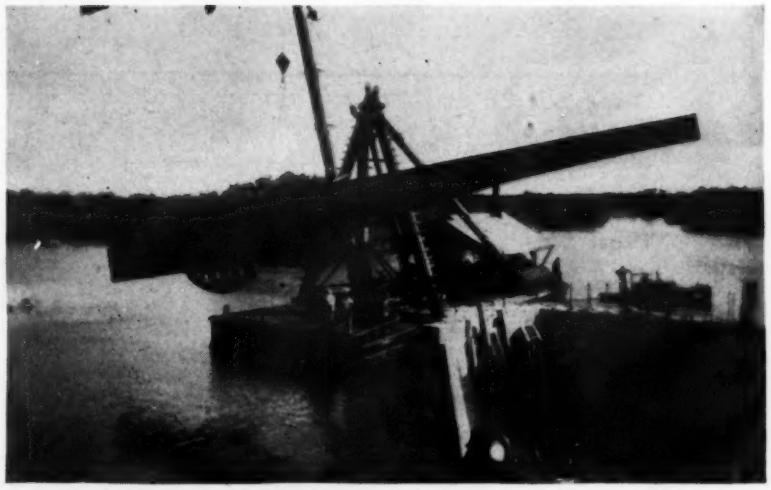


Fig. 6. To join the mainland and Key Largo, the first island, a double-leaf bascule of 100-ft. span was constructed. Girders were erected by a barge derrick. Trunnion pin bearing may be noted at lower right.

miles of old railway line across the islands consisted of widening and raising the old railroad fill to permit construction of a 22-ft. pavement flanked by 7-ft. shoulders. The old fill had been built by dumping 1 to 2 ft. of pit oolitic limestone over wet marl, which over the years became dry and stable.

For the new fill both wet marl and oolitic limestone, mostly the latter, were used, the amounts depending on local conditions. The marl was delivered to the fill by draglines working at borrow pits along the right-of-way. The limestone, which was often covered with a few feet of marl, was usually obtained from borrow pits located near the water's edge. This type of borrow was preferred, because the limestone, being saturated, was relatively soft when first quarried and easier to work. The oolitic limestone hardens on exposure to the air.

Borrow pits were spaced along the project at about 5-mile centers. The normal procedure was to excavate a strip about 30 ft. wide at one end of the pit to a depth of approximately 25 ft. and then to move back and excavate the next 30-ft. strip, this process being repeated as work advanced. To remove the upper few feet of rock, $\frac{3}{4}$-in. dia. holes 8 to 10 ft. deep were drilled with pneumatic equipment at 4-ft centers and filled with 40 percent

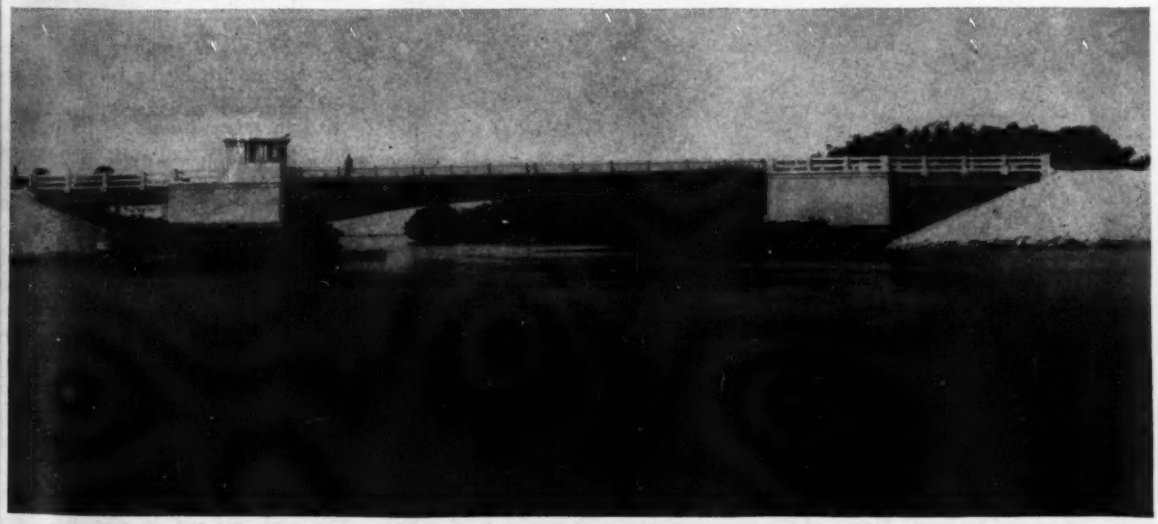


Fig. 7. Completed bascule bridge, which has overall length of 225 ft. and a 100-ft. span. It provides a 26-ft. roadway.

Fig. 8. Most of the oolitic limestone for the paving work was obtained from underwater quarries, the stone being loosened with explosives. Pits were frequently excavated to a depth of 30 ft.

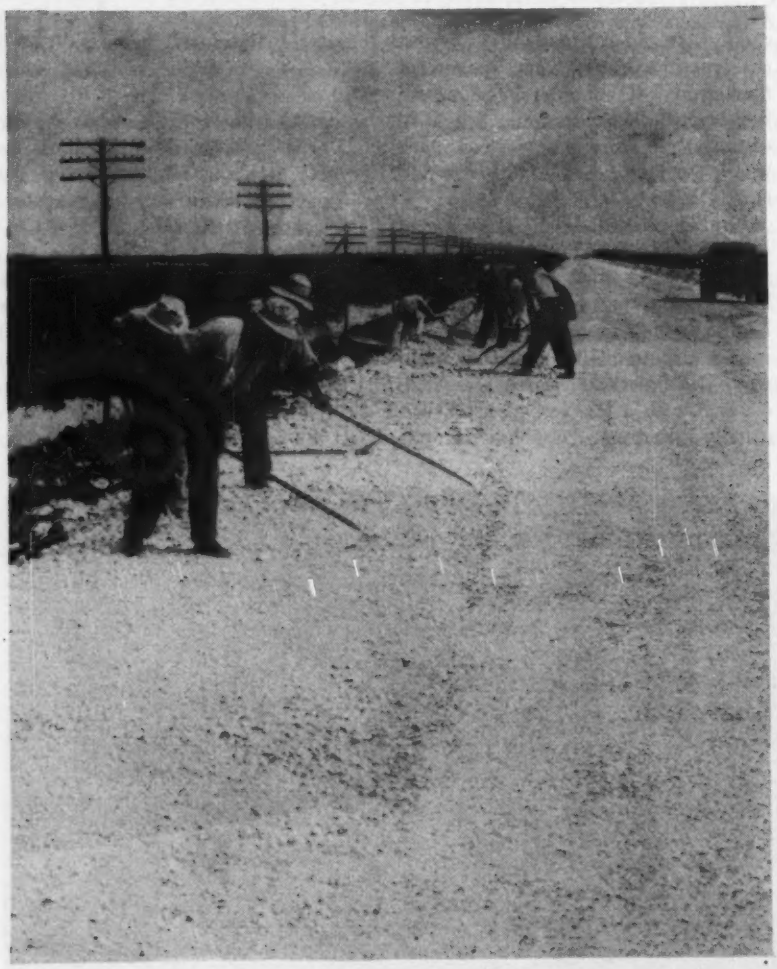


Fig. 9. The 7-ft. wide shoulders were surfaced with oolitic limestone delivered by truck and spread by hand. Slopes of fills were surfaced with marine marl, which is conducive to the growth of vegetation.

dynamite or about 12 sticks per hole. After this charge had been detonated, draglines were able to remove as much as 5 ft. of loosened material, depending on local conditions.

Once the top material was removed, the pit became flooded and for the remaining depth of excavation, 60 to 80 percent dynamite was used. Because of the depth of water generally above the dynamite, no attempt was made to cap the sticks with mud. Usually three cases of dynamite were scattered over an area about 50x75 ft. in 3-stick bundles, a detonator being tied to one bundle. When the one bundle was detonated the entire charge was set off; loosening a large amount of the rock. After this material had been removed by the dragline, the process was repeated.

Trucks transported the limestone from the borrowpits to the job, where it was spread and mixed in about 1-ft. layers by patrol graders.

Pavement built of limerock

Once the subbase was thoroughly compacted with the hauling equipment and rollers, construction of the 22-ft. pavement, which was to have a compacted thickness of 8 in., started. It was built of oolitic limestone and Key rock quarried from flooded pits by the method just described. As a first operation 6 in. of loose stone was spread by patrol graders and rolled with tractor-hauled equipment to break up the larger stone and to reduce the thickness of the material to 4 in.

After a second layer of 4-in. compacted thickness had been added, the material was scarified to a depth of 6 in. by power graders and re-compacted with the heavy rollers. During this latter operation, water was applied in large quantities from truck-mounted tanks, salt water being used much of the time.

Following continued alternate wetting and rolling with smooth 10 to 12-ton rollers, the base course was allowed to dry for ten days. After this period 0.25 gal. per sq. yd. of semi-solid asphalt of 12 to 15 viscosity (approximately 200 penetration) asphalt was applied by pressure distributor at 325 deg. F., followed by 0.5 cu. ft. per sq. yd. of crushed rock which was rolled with a 5-ton tandem, smooth-wheel roller. The rock ranged in size from that passing a No. 11 screen to ¾-in. dia.

Finally, 0.35 gal. per sq. yd. of asphalt of the type used for the first application was applied, followed by 0.25 cu. ft. per sq. yd. of screenings of ¼-in. size or less rolled in place by the 5-ton roller. This work resulted in a pavement of excellent riding qualities. Shoulders 7 ft. wide along each edge of the pavement were surfaced with oolitic limestone.

The slopes of the fills were covered with a few inches of marine marl, which is expected to encourage the growth of vegetation. Frequently these fills are exposed to wave action. Consequently, in some localities a layer of large stone was added from a point a few feet above normal tide level to the toe of the slope and at other points a splash wall was constructed along the toe. In some places the old splash walls built during construction of the railroad were still in in place.

Two types of walls were constructed. The type illustrated by Fig. 10 consists of a continuous row of old railroad ties driven about 5 ft. into the ground 2 ft. beyond the old railroad wall. A second type was built of 1-in. thick boards driven endwise into the toe of the fill with pneumatic hammers, a continuous 2x6-in. timber being added near the top.

Supervision of the work

For the State Road Department of Florida, J. H. Dowling is state highway engineer; E. S. Fraser, bridge engineer; and C. P. Datson, head of plans and surveys. E. C. DeGarmo, assistant state highway engineer, was in general charge, N. S. Emery, division engineer, in charge of contracts, and M. V. Moore, resident engineer on the bascule bridge. For the Public Roads Administration, which supplied the federal government's share of the cost, R. B. Smith, senior highway engineer at Tallahassee, was in general charge.

Cleary Bros. Construction Co., West Palm Beach, was general contractor on the bascule crossing and on modification of the 19 railway bridges. Groves, Lundin and Cox, Miami, did the grading and paving on 42 miles of the project. The remaining work was by force account by the highway department. Total cost of the Overseas Highway, including $3,600,000 spent by the toll district in 1937-38, has been over $8,500,000.

Fig. 10. The new highway replaces an old narrow and winding road, a short stretch of which may be seen at the left. It has a much better alignment and a 22-ft. roadway, which now carries extensive war traffic, as a number of military establishments are located at Key West.

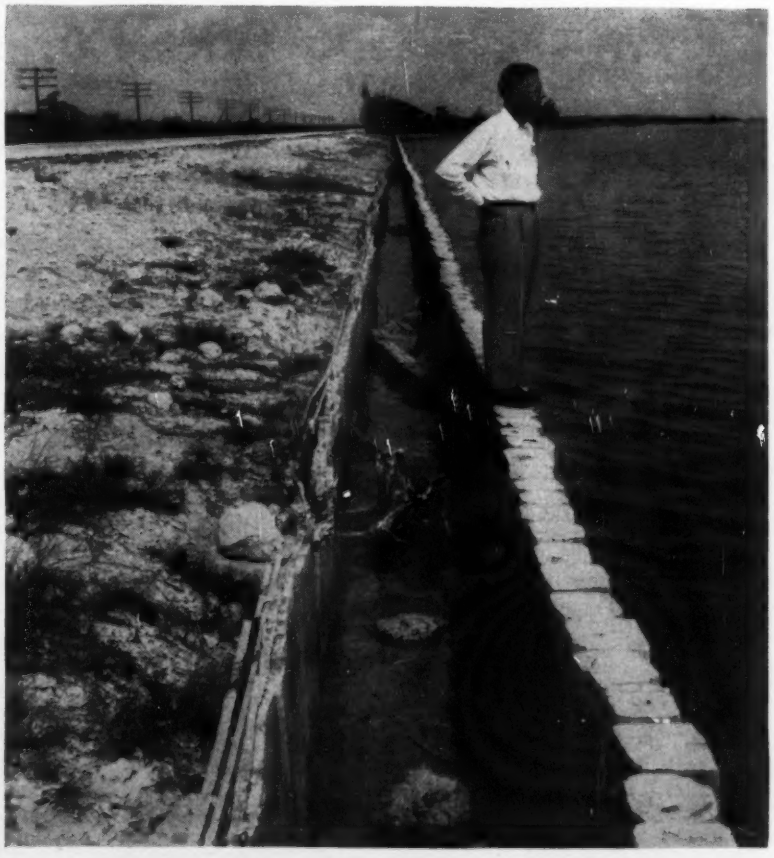


Fig. 11. At many points the fills are protected by old splashboard installed by the railroad company. Added protection from wave action is provided by a second wall built of old railroad ties as part of the present program.

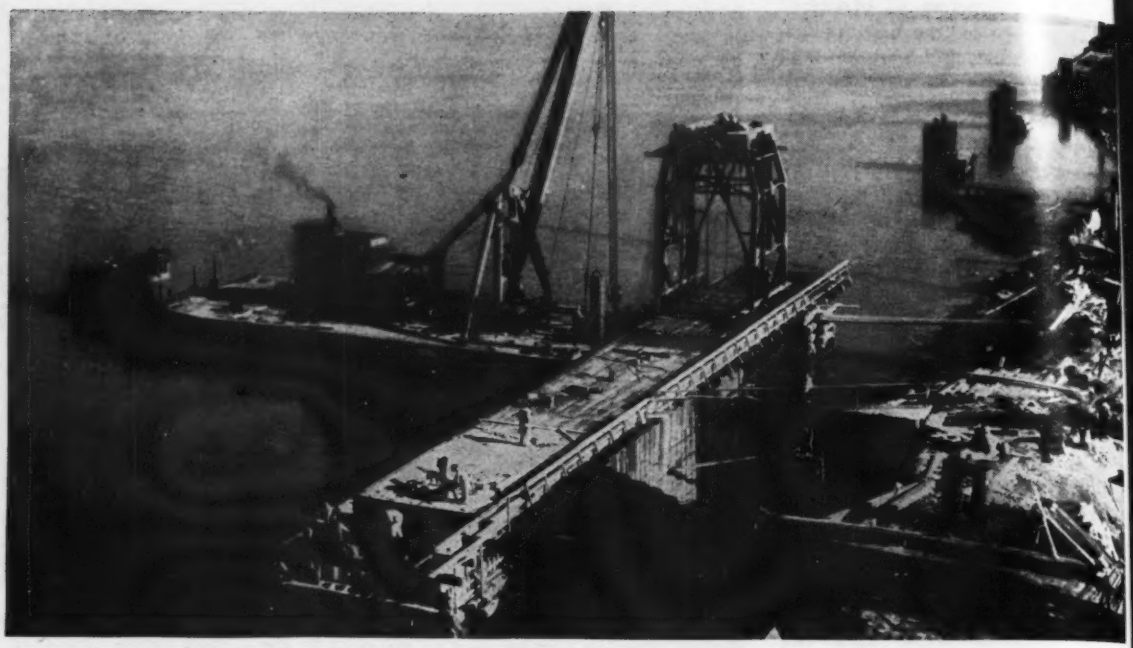


Fig. 1. Support for gantry crane was quickly provided by concrete filled caissons in preassembled timber cribs.

An Outfitting Wharf on Sloping Rock

Walter P. Ehrman
Resident Plant Engineer, U. S. Maritime Commission

***Contents in Brief**—Rigid support for a gantry crane runway and platform deck over sloping limestone bedrock on an inland river was obtained by setting steel caissons in fresh concrete placed on the river bottom by tremie. Caissons were filled with concrete and supported laterally by rock-filled timber cribs to carry a 70-ton wheel-load on the crane girders.*

AN OUTFITTING WHARF over a sloping hard-rock surface was needed in three weeks time to carry a crane mounted on a high gantry. The structure was designed in the field office, adapting it to materials available at the site and to the required construction schedule.

The wharf is located at an inland shipyard and serves a triple purpose —as a platform for live storage, a runway for a 20-ton crane, and an outfitting berth where dock trials of ships can be made. The crane is set on a gantry support some 32 ft. above the wharf deck. Each corner of the support tower is mounted on two-wheel trucks that have a maximum load, from the working crane, of 140,000 lb. The crane gage is 18 ft. and the runway is about 165 ft. long. The crane services two hulls, berthed side by side, and thus requires extreme rigidity in the supporting structure to prevent vibration when reaching out with a low boom.

The river bed at the site, under an average depth of 20 ft. of water, is smooth limestone rock sloping toward the channel. The clay bank has sloughed off into the water making a comparatively soft overburden 8 to 10 ft. deep. The use of piling to support the wharf structure was impractical because the clay offered no lateral support and no toe-hold could be obtained in the rock.

The scheme adopted to meet this condition was to set preassembled timber cribs on the rock, place a shallow layer of concrete and, into this, insert one end of steel caissons, which were later filled with concrete to support the deck structure.

Mud on the river bottom was cleaned with a clamshell bucket operated from a derrick rig on a barge. Four timber cribs, each 16x26 ft., were built on the adjacent bank, fabricated from 12x12-in. creosoted timbers bolted and fastened with drift pins at each bearing. Soundings were made to determine the depth to rock at each crib location. To the height thus found, sufficient length was added to extend the cribs to about 4 ft. above mean water level. Bottom timbers of the cribs were built to conform approximately to the contour of the river bottom.

Jack-screws made of 2½-in. dia. rods, which had been threaded and pointed on one end, were attached at the corner of each crib. The cribs were set by a barge mounted derrick and leveled by the jack screws, which

re adjusted by means of a removble length of extra strong 3-in. pipe t had one end squared to fit simir shoulders on the threaded rod.

In preparation for placing tremie ncrete after the cribs were set and veled, a diver was sent down to place low dam of sandbags, from one to o bags high, on the off-shore side of ch corner. A job-made air-lift pump, hich was assembled from 25 ft. of in. pipe bent at the top, flared at e base and operated by 100 psi. air ressure applied to the foot-piece of e eduction pipe was used to reove all mud within the sandbag ams just before placing concrete. Several inches of concrete, made ith three bags of standard portland nd three bags of high-early-strength ement per cubic yard, was deposited n the clean limestone rock bottom hrough a tremie pipe. The concrete owed under and around the bottom rib timbers at each corner of the tructure, thus making a permanent earing and locking the cribs in lace. The concrete also served as oth a bearing and seal for open-end aisson pipes lowered into it for use s columns.

Caissons made on job

A caisson pipe of 24-in. dia. was olled on the job from $\frac{5}{16}$-in. plate nd butt-welded. This open end pipe as plumbed and lowered into the reen concrete pad placed at the bearing site and held in position until the concrete had set. The pipe then was cut off at the proper elevation and pumped dry. Following a visual inspection, the pipe was filled with concrete to within 6 in. of the required top elevation. Into this concrete dowel reinforcing and shear pins were set to hold the superstructure. Pipes were located so as to have a minimum clearance of 24 in. from the crib timbers.

Reinforced concrete cap-sills, 36x 24 in., with 12x18-in. tie beams were poured with the caisson pipe extending 3 in. into the beams. The cap-sills served as bearings for the crane girders, which in turn support the deck. The beam forms were left in place for protection while the cribs were filled with 4x18-in. stone to some 2 ft. above mean water level. This stone was packed carefully around the pipes to give lateral support as well as protection from impact.

Crane girders are of welded plate construction and completely job fabricated. Web plates are 54 in. deep of $\frac{3}{8}$-in. stock, fabricated with $2\frac{1}{2}$-in. diameter vertical crimps and with stiffener plates, set at right angles, near the ends for rigidity. Flange plates are 1-in. stock and range from 11 to 15 in. in width. One hundred pound steel rail is fastened to the top flange for the gantry runway.

Steel floor beams at right angles to the main girders and 8 ft. c. to c. carry a wood deck. Wood nailers bolted to the floor beams support 4x6-in. creosoted deck timbers which are laid longitudinally with $\frac{3}{8}$ in. between them to provide drainage and permit expansion.

The finished structure was in place and in use three weeks after dredging at the site was completed. Details of design and construction were developed on the job as erection proceeded. The writer served as consulting engineer in charge of construction.

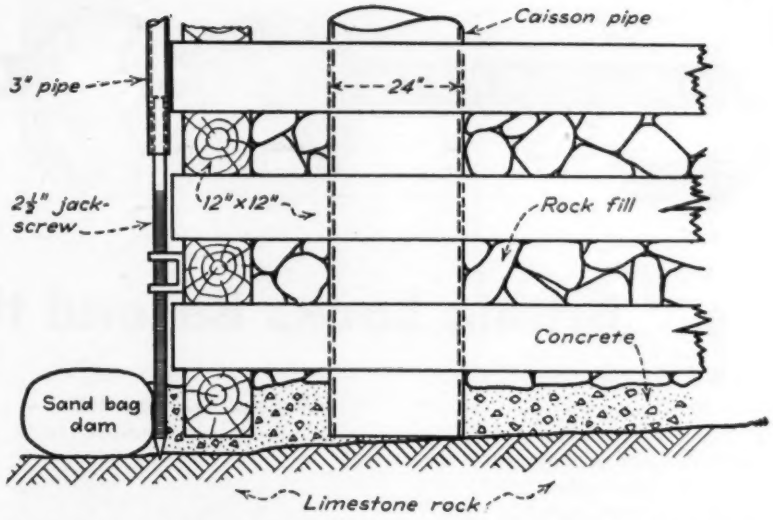


Fig. 2. Cribs were preassembled for approximate depth then leveled with jack screw arrangement and concrete placed by tremie to seat bottom. Caisson, set in fresh concrete and supported laterally by stone filled crib, carries girder load.

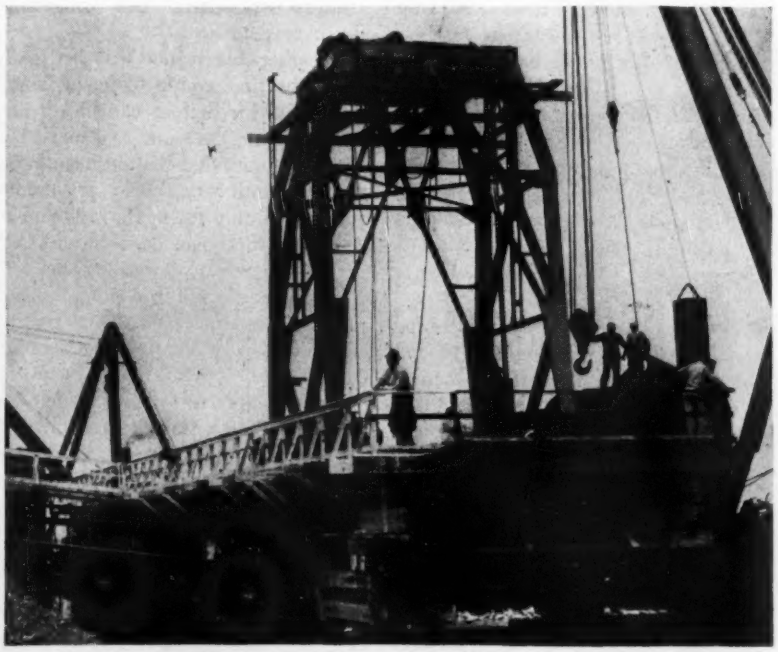


Fig. 3. Encasing the ends of the girders in concrete gives stiffness and stability to the structure.

ENGINEERING ABROAD AS SEEN BY ENR EDITORS

Britain Looks Beyond the Battle

Waldo G. Bowman
Editor, Engineering News-Record

***Contents in Brief**—Since the very beginning of the war Great Britain has been planning for peace. Stimulated by the sight of blitzed cities and the need for improvement in living conditions, industry, agriculture and transport that war conditions have emphasized, the British made postwar planning a continuing task. Some person or group in every Ministry concerned with construction has been charged with postwar planning responsibility. A new Ministry of Town and County Planning was formed. Legislation is being sought to bring all rural land under governmental control so as to guide future development. Cities have drawn up detailed, long-term plans of reconstruction, divided into chronological priority stages. Programs for both private and public housing have been drawn up. Continuance of wartime controls of labor and materials has been planned. Many differences of opinion exist, but there is broad interest in planning.*

BACK IN 1940 Prime Minister Churchill defined Britain's task as "not just to win the battle, but the war." This sentiment has ever pervaded the British fighting effort, and accounts for the fact that postwar planning was never put on ice to wait for peace, but grew as an essential activity even during the darkest days of the blitz.

Plans have taken shape

The fact that the British accorded postwar planning a position of importance even while enemy bombs were raining down does not mean that it did not lag and often stop. It did both. But its importance was not forgotten, and it was never considered unpatriotic nor damaging to the war effort to talk about and plan for the rebuilding of cities and ports, and the improvement of peacetime planning laws and administration. As a result, now that victory is in sight, Britain has many of its postwar objectives outlined, its basic reconstruction machinery organized, and is getting down to details.

Whether blueprints will be ready when the time comes to build is still uncertain, for Britons can bicker and procrastinate the same as Americans. But of the fact that Britain has done a realistic and remarkably productive job of planning for peace in the midst of a war, there can be no doubt.

With Britain's plans in the field of finance, trade and industry this account is not concerned, but it will attempt to sketch her progress and her hopes as they relate to physical rebuilding—the restoration and improvement of her structures through the activities of the engineer, the architect and the builder. For a country that has suffered the blows of modern war, this is a task of first urgency and of unprecedented magnitude.

Planning mileposts of four years

Great Britain's postwar reconstruction planning since 1939 has developed through the following steps listed more or less chronologically.

1. Presentation to Parliament in January, 1940, of the so-called Barlow Report of a Royal Commission appointed in July, 1937, to inquire into the causes and effects of the geographical distribution of industrial population, and to suggest remedies for any resultant bad conditions.

2. Speech in the House of Lords November, 1940, by Lord Reith, head of the new Ministry of Works and Buildings, formed only one month previously to coordinate and supervise wartime building. Lord Reith analyzed the responsibilities of the new Ministry both as to wartime building and postwar planning, and followed this three months later with a speech urging all local authorities to begin getting out rebuilding plans. In addition he set up a panel of experts on building and directed them to begin studies of three heavily bombed cities —Birmingham, Coventry and Bristol —as test areas for postwar reconstruction planning.

3. Appointment by Lord Reith of two expert committees to report on questions raised by the Barlow Report. The Uthwatt committee on compensation to be paid land owners in respect to public control of the use of land was appointed in Jan., 1941, and the Scott committee on land utilization in rural areas was appointed in Oct., 1941. The reports of these committees, rendered in the fall of 1942, set forth significant concepts of land use planning that may have far-reaching and fundamental effects.

4. Formation of a Reconstruction Committee by the Royal Institute of

British Architects in March, 1941, to make talent and advice available to the government and the Ministry of Works and Buildings on all phases of postwar planning. Out of this grew the London Regional Reconstruction Committee, which by May, 1943, had drawn up a comprehensive plan for the London region, as distinct from London County for which consultants were also drafting a plan, in response to Lord Reith's plea cited above.

5. Appointment of a postwar "directorate" in the Ministry of Works and Buildings, followed in Feb., 1942 by a change in name to the Ministry of Works and Planning.

6. Passage of the Town and County Planning Act by Parliament in July, 1943, followed the setting up of a Ministry of Town and County Planning in Feb., 1943 to take over the planning functions of both the Ministry of Works and Planning and the Ministry of Health, and to secure "consistency and continuity in the framing and execution of a national policy with respect to the use and development of land throughout England and Wales." A direct outgrowth of recommendations of the Barlow, Scott and Uthwatt reports, this Ministry is the "central planning authority with a positive attitude toward planning" that British planners, architects and engineers have long urged. If the plans envisioned for this Ministry are carried through, it will be one of the most powerful agencies of the British government.

England and Wales, where 85 percent of Britain's 48 million people live, are about the size of Florida. That fact makes planning desirable, and the war's destruction now helps to make it, if not mandatory, at least more possible.

The evolution recorded by these mileposts in postwar planning has finally led, during the past year, to a number of definite and significant developments. The London County Council's plan for its 116-sq. mi. area was completed by the consultants in July, 1943, and submitted for discussion and criticism to the 28 member metropolitan boroughs. The same consultants got well along toward completion similar plans for Manchester and for Greater London which, including the county, embraces an area of 692 sq. mi. A separate plan for the City of London, the independent 1-sq. mi. "Wall Street" district in the center of the county, where much of the bomb devastation took place, is also said to be in the process of being drafted.

On its part, the Ministry of Town and County Planning has divided England and Wales into ten regional planning districts, with a resident planning officer in each to consult and work with local government engineers; and it has begun drafting legislation to establish its authority and to effect the fundamental recommendations of the Barlow, Scott and Uthwatt reports.

Nor have other ministries been idle. There has been rather general agreement that 4,000,000 dwelling units will have to be provided in the next ten

Acme photo

Bomb damage, such as this in London's Fleet St., is a powerful stimulant to postwar planning in Britain.

Plymouth, next to London, is the most bombed city in England. And being much smaller than London its reconstruction problems may be even more severe.

years, as compared with 1½ million in the first decade after the last war, and 2½ million in the succeeding decade. The Ministry of Health and the Ministry of Works drew up standard plans last summer for some 3,000 rural cottages, turning them over to local authorities to secure bids from contractors; the results were not too encouraging from a cost standpoint, but the procedure did give some insight into the labor and materials problems that beset contractors under present conditions and that may continue on into the postwar period. In this connection, the Ministry of Labor has determined that greatly augmented construction labor forces will be necessary to carry out Britain's postwar building, and that normal labor union apprenticeship procedure cannot supply them. Consequently, it is planning special training courses to turn out at least 200,000 craftsmen in the next three or four years, over and above the 80,000 who may be available from the munitions industries and some 200,000 who will be demobilized from the armed forces. These men, together with those still active in the building industry, should provide a skilled labor force of 700,000, as compared to 525,000 before the war. In addition to skilled craftsmen it is contemplated that some 500,000 common laborers will be required by the building industry.

In so far as actual postwar building practices are concerned, the work of the British Standards Institution in sponsoring development of a national building code is most significant. The objective of the program is to draft a general or "classification" code, and to supplement it with a series of codes relating to methods of using specific materials. The classification code will have chapters on natural light and air; space and circulation; precaution against noise; precaution against fire; strength—stability and loadings; weather protection; services—heating, lighting, water supply; heat insulation; corrosion; and dirt and vermin.

The draft of the basically important chapter on stability and loadings was completed late in 1943, and in addition to conventional provisions includes the modern concept of suction wind forces as well as requirements to make buildings more resistant to bomb damage.

Finally, to bring the record up to date, Prime Minister Churchill in his worldwide radio broadcast of Mar. 26, 1944, stated that Britain would have from 200,000 to 300,000 permanent houses built or under construction by the end of the first two years after the war, that in addition up to half a million prefabricated houses for emergency use would be completed, and that land for government housing projects would be purchased at 1939 prices, and not at those of today; he also revealed that local authorities have already acquired sites for 200,000 houses. To these statements from the highest authority should be added this one by Lord Woolton, Minister of Reconstruction, made at the end of 1943, "It will not be possible for any person to build anything he wants. We shall have to insure for an indefinite period that both building materials and labor are used for purposes of the greatest national necessity."

To appreciate what this progress in postwar planning means, it is helpful to recall that it has gone on while Britain was under constant air attack; indeed, Lord Reith's speech in 1941 urging local authorities to start on rebuilding plans was made at the very time that London, Coventry and other centers were having their worst bombings. There has been no time since when there was complete freedom from the danger of attack, and no time when the country could take on its planning job other than as a supplement to direct war chores.

Definite statistics on actual bomb destruction in Britain are scarce, but those that are available are revealing. The accompanying table shows houses damaged and civilians killed up to the end of 1941, for a number of representative small cities. For the larger cities, only the number killed is allowed to be published, but it can be stated that property damage is relatively much greater than in the smaller places. A statement that is repeated time and again is that one out of every five houses in England and Wales, i.e. 2,750,000 suffered some damage by bombs. It is also said that 2,500,000 houses in England and Wales (40 percent of them in the Greater London area) have been repaired and are occupied. At one time, damaged houses in London were being given first aid repairs at the rate of 32,000 a week.

WHAT AIR RAIDS DID UP TO END OF 1941

	Civilians Killed	Houses Damaged
Fraserburgh	40	700
Aberdeen	68	2,000
Scarborough	30	2,250
Grimsby	18	1,700
Gt. Yarmouth	110	11,500
Lowestoft	94	9,000
Clacton	10	4,400
Margate	19	8,000
Ramsgate	71	8,500
Dover	92	9,000
Folkstone	52	7,000
Hastings	46	6,250
Bournemouth	77	4,000
Weymouth	48	3,600
Falmouth	31	1,100
Coventry	1,236	37,000
Birmingham	2,162	.....
Bristol	1,159	.....
Sheffield	624	.....
Manchester	1,005	.....
Portsmouth	756	.....
Southampton	558	.....
Liverpool	4,100	.....
Plymouth	1,073	.....
Clydeside	1,828	.....
Hull	1,055	.....

Such repairs, however, have not

…t Britain's housing up to any- … near satisfactory standards. …re necessarily of the roughest …s is evidenced by the fact that … summer of 1943 there were …60,000 good houses empty and …ed of repairs for which neither … nor materials were available. …houses, of course, are practically …xistent.

…ore the war, more than 300,000 …houses were being built each … but only 135,000 have been …leted in the past 4 years. There …thus be said to be an accumu- … shortage of over a million new …s in Great Britain. It might be …d that, at the prewar rate, these …n houses would have been built …here been no war, and that there- … the replacements for bomb-de- …ed homes should be added to that …e in any postwar programs. That …t true, however, because many …e houses destroyed by bombings … in the substandard class that …d have been subject to replace- … anyway. Had there been no …bing, Britain would have *needed* …,000 new houses in the past … years. Now it *has* to have them. …e the postwar program of …,000 new houses in ten years.

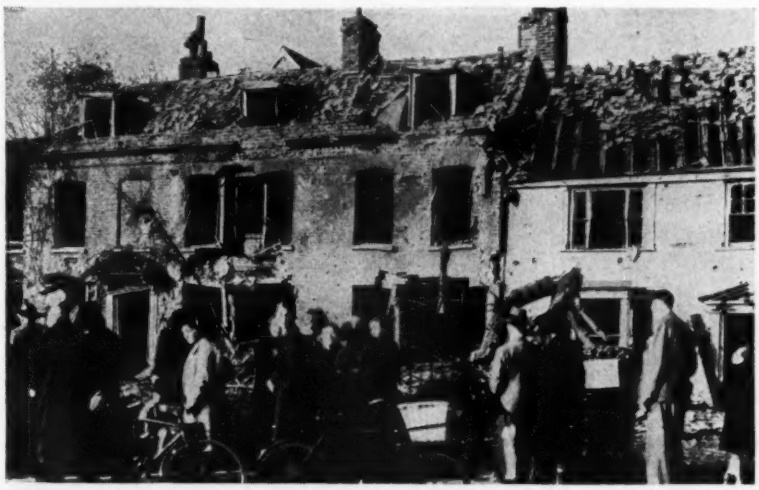
…e emphasis placed on housing …Britain's postwar construction … is natural and logical. The de- …tion caused by war has to be …e good first in the field of hous- …because people need shelter be- … they need other things. An em- …is on housing is logical because … facilities—water supply, sew- …e, public buildings, roads, etc.— …relatively more developed in an …nd built-up country like Britain … in the United States. This is not …y that many of these facilities …d not stand improvement, but the …ish find them reasonably adequate … therefore secondary to housing.

…portance of Ministry of Health

…s in the United States, nearly … federal department, or minis- …, as they are called in Britain, is …erned with some phase of post- … construction, but there are two …se responsibilities are outstand- …and of particular significance in … comparison with similar activi- …in America. These are the old and … established Ministry of Health, … the new and hopeful Ministry of …n and County Planning. The war-born Ministry of Works is also important, as it is the current building agency and also controls licensing of builders, assignments of labor, and priorities on materials, but its postwar future is uncertain. It may or may not be continued in its present form.

The Ministry of Health is by all odds the most powerful of British government departments, so far as construction is concerned. Its job is to supervise "health, housing and welfare", obviously a huge responsibility with many ramifications. It was under its supervision that Britain built the 4,000,000 houses during the 20 years following the last war, thus rehousing one-third of the country's population and moving one million people out of slum dwellings. About 37 percent of these houses, both publicly and privately owned, were built with subsidies, which the Ministry supervised. All housing plans must have its approval as to size of rooms, ventilation, sanitary provisions and the like, while the actual administration of housing programs is the responsibility of the local authorities.

The Ministry of Health also exerts control over local public works in Britain, since all capital improvement financing plans of local governments must have its approval. Even privately owned public utilities, such as water companies, come under its control by virtue of its power over rate charges.



Out of 2,750,000 houses in England and Wales damaged by enemy action, 90 percent have undergone emergency repairs, not all of which, however, are as successful as those shown in these "before and after" views of some row dwellings in a small village indicate.

Many of Britain's postwar flats will follow this pattern. Above all else they will be fireproof, for the great destruction from incendiary bombing is not easily forgotten. This tall flat was erected by the London County Council before the war.

During the war the Ministry has had much to do with the repair of bombed houses, by virtue of the fact that it is responsible to Parliament for the local governmental units of England and Wales. It is also studying postwar housing; has urged local authorities to work out a one-year plan of house construction for which it stands ready to subsidize land purchases; has committees at work drawing up standard house plans and has used some of them for the 3,000 rural cottages now underway; and is actively engaged in regional and city planning. Obviously, these manifold activities give the Ministry of Health great authority over building matters in Britain, although during the war the Ministry of Works has also occupied a prominent position. In peacetime it might be said that the Ministry of Health is Britain's Federal Works Agency. It lacks the authority over roads that our FWA has, but that is all.

Planning and a new ministry

When we come to organized postwar planning in Britain today, however, the Ministry of Town and Country Planning must be given a prominent place. It has no counterpart in the United States, but its potentialities are so great and its plans for developing them so radical (by our standards) that it has great significance. Moreover, the three or four decades of planning experimentation which led up to the establishment of the Ministry may well contain lessons for American planners.

The first thing to note about planners in Britain is that they have what amounts to a separate professional status. This has been brought about through the efforts of the Town ning Institute, organized in 19 interested architects, engineers public officials. Growing rapid membership and influence, this tute was the pioneer and is no leader in developing planning niques and in drafting planning lation. In addition, it has take responsibilities so seriously th admits to membership only those can qualify by passing a stiff w examination somewhat comparab the most difficult of the examina given for licensing engineers in country. The net result is a bod planning officials and practitio scattered throughout Great Br who know their business and wh constantly trying to improve knowledge and techniques.

Planning in England dates bac the Housing and Town Planning of 1909, which enabled boroughs urban districts to prepare town p ning schemes. After simmering ten years under this mild legisl heat, planning was given further by the Housing and Town Plan Act of 1919, which gave local auth ties the power to combine and f joint committees for the purpose preparing or adopting town plan schemes. Next came the Housing of 1923, which widened the appl tion of the 1909 act a little furt by enabling the Minister of He to authorize the preparation o town planning scheme for l (whether it was developed or n with the object of preserving the e ing character and features of a lo ity with special architectural or h toric interest. Finally, in the To Planning Act of 1925, town planni which had previously been treated an addendum to housing, was gi independent legislative status.

Although progress was recorded these acts, statutory planning, ne theless, was largely limited to ar adjacent to urban centers until Town and Country Planning Act 1932 came into operation. It was der this act that the majority of rent planning schemes in England Wales were originated. By the of 1942 plans had been prepared approved covering some 1,056,0 acres, while schemes covering t thirds of 26 million additional ac were in course of preparation; these latter schemes, plans cover

,000 acres, had, by the outbreak
war, been deposited with the
ter of Health for final approval.
one authority expressed it, how-
"the story of the 1932 Act is
f high hopes and subsequent dis-
intment". This was because it
ed entirely inadequate for the
ulation of country planning
mes, since basically it is an act
rolling "development" which, as
merica, means building and simi-
orks. In Britain, agricultural de-
pment, i.e., protecting the all-too-
farming acres from urban and in-
rial encroachment, is a prime ob-
ve of planning, a fact which
ld not be overlooked in compar-
British and U. S. planning.

ecause the 1932 act was deficient
provisions limiting building on
icultural land, it was necessary to
rt to a subterfuge and place a
t on the number of buildings per
. Zoning, therefore, became a
tice of setting building densities
l, 3, 5, 10 or even 50 acres per
se. As a result, a fantastic plan-
record was achieved by 1937; the
ount of land which had then been
ned" for housing was large enough
accommodate a population of
rly 300 million people additional
he actual population of only 41
lion. The absurdity of this state
affairs led the Minister of Health
1938 to ask an advisory commit-
to study the possibility of intro-
ing into planning schemes the
nciple of "use" zoning to replace
"density" zoning. This is one of
problems that the new Ministry
Town and Country Planning has
erited.

One further piece of planning leg-
tion is worth noting. This is the
triction of Ribbon Development
t of 1935 which was passed to check
expansion of "ribbon" building
ng main traffic roads, and to con-
l new points of access to those
ds. It was not very successful. The
incipal accomplishment was to
se the building of service roads
tween the main roads and the
uses which lined them. The service
ds proved useful, but the mere
dening of the ribbon did little or
thing to overcome the esthetic and
cial objections inherent in that
rm of development.

Through all of these acts, planners
ve made progress. They are agreed, however, that the acts have failed in their broad purpose of establishing planning as the major, workable enterprise that it must be because they have only nibbled at the edges of the problem and have omitted the establishment of a strong central body with authority to require planning schemes to be carried out, or even to initiate schemes when that is necessary. In addition, and probably most fundamental, the acts failed because they provided no satisfactory solution of the problem of claims for compensation against the authorities by landowners whose holdings were affected by planning schemes.

New concept of land control

This question of compensation is a second problem that faces the new Ministry of Town and Country Planning. Here, however, it has something very definite to work on, namely the 1942 report of the Uthwatt committee on compensation, previously referred to. Unusual and radical compared to U. S. thinking, and even to much British thinking, the recommendations of this report, marking as they do a move toward nationalization of all land in England and Wales, will apparently be embraced and promoted by the new Ministry.

As to undeveloped land, the Uthwatt Committee recommended the immediate vesting in the state of the rights of development in all land lying outside built-up areas on payment of fair compensation, such vesting to be secured by the imposition of a prohibition against development otherwise than with the consent of the state. This would be accompanied by a grant of compulsory powers to acquire the land itself (in addition to the right of development already held) when it is wanted for public purposes or for approved private development. Whenever any land is purchased by the state it would never again be sold, but only leased, and this leasing could be either to public authorities or to private interests, but always under the development control of a central planning agency. (The agency envisioned by the report is the Ministry of Town and Country Planning subsequently established by Parliament).

As to developed land, legislation was recommended providing that all areas not already covered by operative planning schemes or resolutions to plan should be deemed to be subject to such resolutions. On developed land, however, there was no thought that the government should buy up the development rights, as on undeveloped land. Such a course was deemed to be both too expensive and too complicated. At the same time,

Many two story row houses were built in Coventry after the blitz. It is likely that a similar type of construction will be used in the postwar period.

when and if any developed land should be purchased by the state, it also should never again be resold, but only leased.

All of these broad questions, relating to what British authorities term "a proper atmosphere for planning", have their solution, it is hoped, in new legislation that the planning Ministry can be expected to push with all possible vigor and speed. In an address in June, 1943, W. S. Morrison, Minister of Town and Country Planning, said "My Ministry operates under the 1932 Act today. The Town and Country Planning (Interim Development) Bill, now before Parliament is an extension of that Act. It is merely a forerunner of legislation that is to come. You will recall that the Act of 1919 permitted local authorities to combine for planning purposes. In the bill now before Parliament I am seeking powers which would enable joint committees to perform their work more effectively. I am also seeking powers to enable me to set up joint committees without the express request of any of the local authorities concerned. I hope I may not have to use them, but they are necessary if the national concept of planning is to be established. Briefly, the objectives of the bill are to assure that no acre shall go unplanned, to prevent the plans of local authorities being frustrated while still in the workshop stage by selfish development, and to facilitate cooperation between local authorities."

The job ahead

What of the existing and potential physical condition of the nation that is to be the raw material of these planning endeavors? The 1942 report of the Scott committee on land utilization in rural areas throws some light on this in a brief discussion of probable postwar trends.

Says the report, "It is difficult to see any reason for a change in the prewar tendency of light industries to gravitate to the larger consumption centers, even though the wartime dispersal of industry may be continued to a degree. Unless the government takes steps to check such a movement, the expansion of big population centers in the southern Midlands and in the south and southeast of England will continue, and London and Birmingham are likely to spread very much farther afield. The social consequences of the concentration of huge masses of population in a few centers, and the physical effect on the countryside, would constitute a national tragedy."

"There will be a great increase in motoring, and this will tend to spread the dangers of haphazard building in an ever-widening circle around existing towns." Obviously, in the opinion of this committee, the war has done nothing automatically to remove any of the prewar problems that challenged planners.

On the other hand, it is not to be overlooked that the devastated areas of blitzed cities offer new opportunities free of other prewar problems. Whereas integrated national planning, while showing substantial progress, is still in the formative stage, planning in the cities by the local authorities, aided by advisory boards with the national Ministry, is getting down to cases. Bristol affords an interesting example.

Bristol offers great opportunity

Since long before the days of the Elizabethan adventurers, Bristol, located a few miles up the Avon estuary from the Severn estuary on Britain's west coast, has been one of the country's great ports. Its docks were naturally a prime target for German bombers in the early days of the war and because these docks adjoin the city's business and commercial section, this area took a terrific pounding. Its postwar rebuilding is naturally of top priority status, and the opportunities offered the planners to create something finer and more efficient in place of the old and outmoded layout are tremendous.

Already these opportunities are being grasped. Before the war the city had begun construction of a high-capacity ring road around the business district, but because of existing structures and streets, several departures had to be made from the most logical alignment. Now the whole area of about a mile in diameter inside the ring road is largely devastated, so that not only can the ring road be relocated, but a wholly new street pattern can be laid out. Industries that did not belong in the business district can be moved to open areas adjacent to the docks, which can be enlarged, and a modern shopping and business district can be developed. Moreover, a modern system of underground utilities, which even though envisioned seemed unattainable before the bombing, can now be laid out to conform to the new street pattern. The city had been ready to let a 4 million dollar trunk sewer contract just before the war, to be followed by a huge interceptor sewer tun-

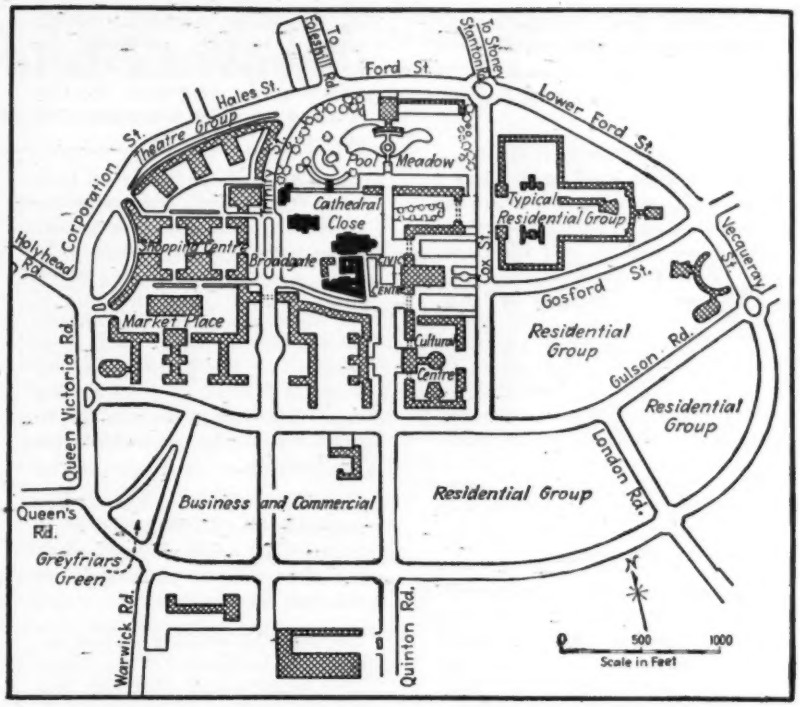
English village housing after the war will in many cases adhere to the traditional thatched roof pattern. These were built in 1939 in the English county of Hampshire.

uch as 200 ft. deep, to carry flood rs past the city, and was then go- to tackle the sewage collection m. Because of the bomb dam- the collection system can now be t first, which will aid in the de- of the trunk and interceptor. lans for all of this work are being ted by the city engineer, working r the direction of the planning mittee of the Bristol city council, with the active help of the re- nal representative of the Ministry Town and Country Planning. And tol is going even farther. Al- ugh its planning before the war been on a regional basis, cover- an area of 80 sq. mi., about twice t of the city, now it has expanded area to about 150 sq. mi., and in junction with the Ministry of wn and Country Planning is bring- joint town boards in the region the work, especially on the prob- s of rural planning.

Plans for other seaport cities

These activities of Bristol are be- duplicated in other cities, as for mple in Southampton, which in- d of having one badly damaged tion, has a number of smaller ones; Exeter which has three widely arated points of damage, and in mouth which has one about the e size as Bristol's. Plymouth, rated ond only to London among badly mbed British cities, has been work- for months on plans not only for uilding this devastated area but generally improving the city. The ter of the city, involving the shop- g area and municipal buildings, w merely a pile of rubble, will be uilt to modern standards with le streets, fine shops and an exten- e civic center. It is planned to ve one wrecked building standing, e Church of St. Charles, to remind ture generations of what Plymouth athered. Some 33,000 new homes e contemplated in a 10-year pro- am, while at the same time sur- nding towns and countryside in- lving an area ten times that of the y are being brought into the plan, the hope that nearly 50,000 of the y's present 220,000 population can accommodated outside.

It is particularly significant that ymouth is basing its postwar plans an area ten times that of the city oper, again attesting to the fact that



Postwar rebuilding of Coventry, where bomb devastation was unusually severe, is envisioned as following this plan prepared by the city architect. Dozens of streets and the heterogeneous businesses grouped in small blocks, characteristic of prewar Coventry, are eliminated.

one of the important basic principles of planning is gaining favor. Coventry, too, should be mentioned for this city of 250,000 population, which suffered damage to half of its 75,000 homes and completely lost 4,000 of them and most of the public buildings, had approved plans for several new civic centers and for municipal buildings, shopping and recreation and a new highway system six months after the big blitz of November, 1940. The larger cities—London, Manchester and Liverpool—are attacking their rebuilding plans in an equally active and realistic manner, without waiting for the outcome of Parliament's deliberations on new laws and regulations.

Opposition and healthy criticism

All of this fine progress might lead to the conclusion that Britain is of one mind on postwar planning, and that the usual differences of opinion disappeared under the blast of bombs. Nothing could be farther from the truth. Depending on one's point of view, social workers are still either great humanitarians or dreamers; planners are realistic or they are radicals; architects are obsessed with air castles or they are the only ones who can see the whole problem plainly; and engineers are blind specialists or they, alone, have the only practical viewpoint. And, of course, government officials are just as fair prey for criticism as they are in this country. At a large postwar reconstruction meeting in London last July, sponsored by the British Industries National Council, an organization similar to our local Building Congresses, but of national scope, here are some of the things that were said:

> Let's not have too much control. Let the building industry do the job itself, reserving for the Ministries the job of setting up principles and gathering statistics.

> It is a mistake to think that the Uthwatt recommendations, if adopted would solve all problems. They will not, particularly since they apply too much to rural lands. The big immediate problem is urban land. In this, we need the building societies (mortgage loan instiutions) to aid the planners. In other words, private enterprise. Building societies control a capital of 780,000,000 pounds and are a much greater factor now than after the last war. We need governmental control only

to govern bad (inexperienced) builders and to give overall direction to developments such as the great estate owners used to exercise.

Be realistic. What actually could we do today? You could make a survey yourself, but where are the roads to be? The Ministry of Transport has not yet laid them down. What about green belts? Where are they going to be? Will they be two or five miles wide? Also, we need to know about the cost. Under present procedures the town must pay, but obviously it can't. What is the government going to do on the matter of costs?

What about the location of industries? The Ministry of Health must tell us what government will pay in moving industries.

What about the density of population? Should it be 138 to the acre as the London County Council says? How much open space per 500 or 1,000 people? We need some governmental guidance.

We need new specifications for modern materials or even for some of the older materials. Should pipes be outside or inside the house? The Ministry of Works is trying to do something, but the Ministry of Health handles such matters.

We now have the power to keep labor from moving from more important to less important work; also the power to direct men to the more important jobs, no matter where they are. The good will of the industry has made these drastic powers effective. What about these controls in the postwar period? They need to be kept so that the more important tasks can be assured against less important luxury building.

There is too much research on new materials. The working man wants a traditional house of brick, stone and slate. Substitute materials are not durable enough.

The building industry cannot improve its productivity two times, as it must, unless there are new materials.

The great demand will be for houses to rent, not for the building society type that is purchas
Private industry must build th
houses to rent.

Such divergent views can be he
at every postwar meeting in
United States, too. And it is beca
they are heard that Britain's prog
and problems in postwar reconst
tion and regional planning are wo
watching with interest and sym
thetic understanding.

Just how far we can or should
in adopting or adapting any of
practices or proposals is not in qu
tion here. What is important is t
we should be informed about the
so as to discard or use as our sit
tion may dictate, influenced as it
ways will be by the great differen
in size, population and basic econo
between Britain and the United Stat
But on a broader level than the m
details of Britain's postwar planni
is the bold, determined, realistic a
unremitting manner in which she h
pursued a course of looking beyo
the battle and preparing for the ti
of peace. That, at least, is wo
emulation.

Invasion Preparations Put a Staggering Load on British Railroads

As operations are pushed in England for the invasion of Europe, the British railroads are engaged in the transportation of a staggering load of both freight and passenger traffic. A recent report in *Engineering* magazine reveals that the 1943 passenger-mile traffic of the London, Midland & Scottish Ry. was 70 percent greater than before the war, and that this increase was being handled with 31 percent less passenger-train miles.

The overall result was that the average passenger-train load was 146 percent greater. Corresponding figures for the Southern Ry. were an increase of passenger miles by 60 percent and a decrease of pass enger-train miles by 30 percent. This company has run 20,000 spec l trains for navy, military and air personnel since the beginning of the war. The increase of traffic on other railroads was also great.

Freight traffic exhibits a corresponding state of affairs. In 1943, the London Midland and Scottish Ry. moved 10,600 million ton-miles of freight-train traffic, which was an increase of 3,670 millions on that for twelve months before the war. The loaded-car miles at 1,725 millions, showed an increase of 410 millions; the empty-car miles were actually less, which may be attributed both to private-owner cars being used as part of the common pool and to the campaign for a quicker release of the cars upon arrival at a given destination. On the Southern Ry., the loaded-car miles increased by nearly 50 percent, and the freight-train miles by 25 percent.

The fact that these greatly-increased loads are being successfully handled by British railroads at a time when repair and maintenance facilities have been much reduced is a tribute to the efficient way in which the railway companies' property has been maintained in the past. Had the outbreak of war not found railway equipment in a state of high efficiency, the present performance would hardly have been possible, *Engineering* reports.

At the present time, the railwa
are only permitted to carry out wo
essential to the war effort, and ev
for that they experience great dif
culty in obtaining the necessary lab
As a result, mechanical and engine
ing equipment of all kinds is bei
subjected to a severe test of its qu
ity. For example, the arrears of co
plete renewal of the permanent wa
of the Great Western are now equi
lent to the total renewal work whi
would normally be carried out in
period of 15 months; the arrears
locomotive renewals represent a no
mal two-years building program;
passenger stock they represent
three-years' program.

The federal government agreeme
under which British railways a
now operating allows for a mai
tenance charge equal to the averag
amount appearing in the records
the railroads for the years 1935-3
37, subject to such adjustment a
may be necessary owing to variati
in the costs of labor and materi
This agreement, however, makes n
provision for abnormal wear an
tear, and charges under this ite
may only be included in the fina
settlement in so far as the gover
ment agrees.

Book Notes and Reviews

The month's addition to the engineer's reading and reference list

Pile Driving Handbook

E DRIVING HANDBOOK—By Robert D. Chellis. 276 pp. Pitman Publishing Corp., New York and Chicago. $4.50.

This is a real pile driving handbook, based upon the experience of many engineers and put in a form usable by other engineers. It covers briefly the theory of pile foundations, describes the available driving equipment, methods of driving and the kind of piles best adapted to different conditions. A chapter is devoted to precast and cast-in-place piles of various kinds. Several pages are given to discussion of deterioration of piles and methods for preservation for wood, steel and concrete, in and under water. Tables in the book give information on sizes, weights and capacities of hammers and extractors as well as the several kinds of bearing and sheet piles.

The author recognizes the shortcomings of any pile formula, especially when attempts are made to use such a formula in plastic soils. However, he also recognizes that such formulas provide a convenient means of appraising the load bearing value of soil, especially on jobs too small to warrant the expense of an elaborate subsurface soil study. Consequently, he devotes considerable space to pile driving formulas reviewing those in common use and pointing out their weaknesses.

In doing this Mr. Chellis points out the principal weakness of the oldest and probably the most widely used of current formulas, the *Engineering News* formula, when applied to modern piles, namely, its failure to take into account the weight of the pile, and pile-driving equipment.

Because of the continuing need for a pile-driving formula Mr. Chellis proposes a dynamic formula that takes into account the weight of the pile, all of the driving equipment, temporary compressibility of the pile head and cap, compression of the pile and compression of the ground. By taking these factors into account, results are obtained that are said to be fairly uniform for a given depth of penetration with the same size piles of different weights.

This is the first handbook on pile driving to be produced in this country for many years. It is unique among even the best of general handbooks in that it presents information on all of the competitive piles and pile driving tools. The author evidently has drawn on the experience of many men throughout the country who are familiar with foundation work as well as on the personnel and resources of his own firm, Stone & Webster Engineering Corp. In addition to presentation of these data, the author, has given his evaluation of equipment and processes.

The book is an unusually useful tool for anyone concerned with foundation work.—H. W. H.

Mapping from the Air

ELEMENTS OF AERIAL PHOTOGRAMMETRY—By Earl Church. 95 pp. Syracuse University Press, Syracuse, N. Y. $2.00.

Part I of this book is devoted chiefly to the fundamental mathematical theory of photogrammetry. A set of 15 interesting examples are included which illustrate the principles presented. Some photogrammetrists may find that the nomenclature used in the text is different from that to which they are accustomed. The nomenclature does not agree in full with that recommended by the American Society of Photogrammetry.

Part II is devoted to practical mapping methods including a brief description of the following: Stereocomparators, radial plots, mosaics, multiplex equipment, perspective grids, and the tri-metrogon procedure. In discussing these various methods the author at times disagrees with several short cuts successfully used in practice—such as the approximate rectification of prints for laying mosaics.

Since practical procedures in photogrammetry change rapidly, it is very difficult for any one person to keep up to date with all of the many details. Several procedures in use at the present time differ from those discussed. For instance; (1) auxiliary control stands are seldom used in multiplex operation; (2) the tri-metrogon method utilizes a rather rigid tilt correction procedure, instead of negelcting it entirely as stated.

The book was prepared primarily as a text for a first semester course at Syracuse University where the author is a professor of photogrammetry. For a book of such few pages the author should be congratulated in being able to include such a variety of important items. The book should prove useful as an introductory text to the subject. If Prof. Church ever decides to expand this material into a larger volume, he has an excellent base on which to build.—*Reviewed by* REYNOLD E. ASK, *Associate Photogrammetric Engineer, U. S. Coast & Geodetic Survey, Washington, D. C.*

Regional Development

TVA—DEMOCRACY ON THE MARCH—By David E. Lilienthal. 248 pp. Harper & Brothers, New York. $2.50.

The record of the Tennessee Valley Authority as here set forth is an impressive one even after making a liberal allowance for the author's enthusiasm for the agency of which he has been a director since its inception. But only a small part of the book relates directly to accomplishments of the TVA. Much of it is given over to arguments, based on TVA experience, in favor of applying the same methods to other regional development problems and to such current national problems as disposal of surplus war plants and equipment. The author believes that if democracy is to succeed, government must be something more than an umpire to settle the conflicts between free enterprises. It must stimulate the productive capacity of the individual and foster collective action in matters requiring group action.

On the other hand, Mr. Lilienthal is strongly opposed to centralized government (and centralized business) as well as bureaucratic control. He favors regional control, with the region small enough so that the administrators are never far from the "grass roots".

Mr. Lilienthal idealizes the original TVA act as having written into law

"the basic principles and practices of modern management." True, the act did give the directors broad powers and almost complete independence from centralized control from Washington, but one would be innocent indeed who does not recognize that the same powers in the hands of a different set of men could have produced the most powerful and autocratic bureaucracy the nation has ever seen.

Which leads this reviewer to observe that nowhere in the book is there mention of Arthur A. Morgan, first chairman and chief engineer of the TVA. Surely, his idealism and independence of spirit must have played some part in making the TVA what it is today.—V. T. B.

Sewers at Louisville

FINAL REPORT OF COMMISSIONERS OF LOUISVILLE—894 pp. Published by the Commission, Louisville, Ky.

Louisville had only eleven miles of sewers in 1870 although its population was 100,000. In 1900, with a population of 265,000, its sewer mileage was 99. By 1920, when the special sewerage commission was settling into harness, there were 285 miles of sewers. At the close of 1942, when the commission was closing up its work there were 550 miles of sewers, including extensions not under the jurisdiction of the commissioner. In the 23 years of its activities the commission built 87 miles of intercepting, relief and ordinary sewers. These ranged from the lower end of an 18¼x27½ ft. inverted egg-shaped sewer to an 8-in. pipe lateral. The cost totalled $18,000,000. With the mighty Ohio sweeping its long water front, disposal by dilution has been feasible but studies point to future part-time treatment.

A comprehensive report on the work of the commission has just been published. Most of its 900 pages are filled with a detailed report by the chief engineer. Part I is devoted to design, Part II describes construction, Part III contains recommendations for extensions. Appendices give much supplementary information. Notable features of the report are rainfall records, descriptions of the methods followed in determining flow capacities of the sewers; choice of various sewer types, both as to cross-section and materials; design of various accessories; and the various methods of construction employed. All these are fully illustrated by line drawings and by reproductions of photographs. References are made to the many standard types of specifications and of laboratory testing methods followed.

John B. F. Breed, who for 23 years had been assistant, then city engineer, was chief engineer of the commission from 1920 until his death in 1928. Woolsey M. Cage, who had been designing engineer since 1920, had been named consulting engineer and assumed charge of the work after the death of Mr. Breed. On the sudden death of Mr. Cage in July, 1940, C. Frank Johnson became chief engineer. He had previously been junior, then senior engineer since 1930. Harrison P. Eddy, and after his death, Metcalf & Eddy, served as consulting engineer from time to time.

Although only high spots in the report have been touched, enough has been said to show that the volume is of great potential value, not only locally as a record of accomplishments and as a guide for work to come but also to such engineers and contractors outside Louisville as are so fortunate as to obtain a copy for their libraries.—*Reviewed by* M. N. BAKER, *Associate Editor (retired), Engineering News-Record, Upper Montclair, N. J.*

Miscellaneous Notes on Booklets and Reprints

THE NORTHWEST GOOD ROADS ASSOCIATION initiated a planned postwar public-works program for Minnesota that has developed into the Minnesota Postwar Public Works Planning Project. This group has issued two valuable pamphlets entitled "Procedure" and "Organization of County Postwar Public Works Planning Boards." Copies can be obtained from the association, Plymouth Bldg., Minneapolis, Minn.

TWO PAMPHLETS ON BUILDING CODES have just been issued by the American Standards Association. Both are part of the building code standardization work being carried out under the supervision of the Building Codes Correlating Committee of the A.S.A. One covers "Administrative Requirements for Building Codes" (35c.) and the second, entitled "Masonry" (50c.), covers recommended building code requirements for non-reinforced masonry. Copies can be obtained from the American Standards Association, 70 West 39th St., New York 18, N. Y.

CONCRETE BLOCK—its use in manufacture—is fully described in a manual issued by the Besser Manufacturing Co., Alpena, Mich. Types of block, specifications, building code requirements, building methods and designs for low-cost housing are included. Price $5.

THE SECOND MILE—A RESURVEY, a new version of "THE SECOND MILE" by W. E. Wickenden, has been issued by the Engineers Council for Professional Development, 33 West 39th St., New York 18, N. Y. (10c.). The original address of President Wickenden of Case School of Applied Science, made before the Engineering Institute of Canada in 1941, was widely reprinted for the guidance of young engineers. Copies of the new survey in quantities for distribution to engineering students can be obtained at a special rate from the ECPD headquarters.

AN UNUSUAL OPPORTUNITY to see ourselves as others see us is provided by "Methods of Building in the U.S.A." a report to the British Ministry of Works by a special mission sent to this country last year to determine in what way our methods of construction and use of materials could contribute to the British post-war effort. The mission was headed by Alfred Bossom, an architect and builder who has spent several years in this country. Copies may be obtained from the British Information Services, 30 Rockefeller Plaza, New York. Price 10c.

New Engineering Books

PILE DRIVING HANDBOOK—By Robert D. Chellis. 275 pp. Pitman Publishing Corp., New York. $4.50.

BUILDING REGULATION IN NEW YORK CITY—By Joseph D. McGoldrick, Seymour Graubard and Raymond J. Horowitz, 70 pp. The Commonwealth Fund, 41 East 57th St., New York. $4.50.

(*Continued on page* 138)

Exide-Ironclad Batteries give you *greater*

OPERATORS of mines and quarries, and contractors on tunnel operations have come to depend on Exide-Ironclad Batteries for sustained speeds throughout each shift, plus tremendous power on steep grades and under heavy loads. Costs are reduced because Exide-Ironclads work long and hard with a minimum of maintenance.

The reason most operators and contractors choose Exides is because they have combined in them the characteristics essential to economical and efficient operation. Rugged dependability, long-life, high electrical efficiency, and high power ability. That's why, when you buy an Exide, you *Buy to Last.* By taking care of it you *Save to Win.*

ARMY E NAVY

Exide
IRONCLAD
BATTERIES

"BUY MORE THAN BEFORE IN THE FIFTH WAR LOAN"

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32
Exide Batteries of Canada, Limited, Toronto

CONTRACT UNIT PRICES

What contractors are bidding on different kinds of construction work

EARTHWORK AND STRUCTURES
MADERA CANAL, CALIFORNIA

OWNER: Bureau of Reclamation, Central Valley Project, Friant Division, Friant, Calif.

PROJECT: Earthwork and structures from Sta. 1050+75 to Sta. 1926+90 on the Madera Canal, Friant Division, Central Valley Project, California. Includes all excavation for canals; construction of canal embankments; construction of dikes for Madera Reservoir; and the construction of drainage culverts, drain inlets, bridges, checks, turnouts, siphons, drops and chutes located at various points along the canal.

CONDITIONS: Government to furnish cement, reinforcing bars, metal pipe, timber in structures, asphalt plank on bridge floors, elastic joint-filler material, metal water stops, blow-off valves and connections, gates and gate hoists, and miscellaneous metalwork. Contractor to furnish all sand and coarse aggregate for concrete. Time for completion is 400 calendar days. Rail and highway transportation facilities available. Wage rates prevailing are: carpenters, $1.25 per hour; cement finishers and tractor operators, $1.50; batching- and mixing-plant operators, $1.25; drag-line operators, $1.60 to $1.75; and unskilled laborers, 85c.

BIDS: Eighteen bids were received Dec. 22, 1943 on Schedule I, ranging from the low of $165,365 to $280,937; and on Schedule II, on the same date, ranging from the low of $456,307 to $673,817. On the combination of the two schedules, eighteen bids received ranged from $630,066 to $916,388.

Schedule No. 1

PARTIAL LIST OF BIDDERS:

1. Mittry Bros. Constr. Co., Los Angeles, Calif. (low bidder) $165,365
2. H. Earl Parker, Marysville, Calif 172,075
3. A. Teichert & Co., Sacramento, Calif 173,759
4. Winston Bros. Co., Los Angeles, Calif 180,405
5. J. E. Haddock, Ltd., Pasadena, Calif 182,202
6. Clyde W. Wood, Inc., Los Angeles, Calif 187,596
7. Frederickson & Watson Constr. Co., and Frederickson Bros., Oakland, Calif. 192,411
8. Guy F. Atkinson Co., San Francisco, Calif 203,750
9. Larsen Bros. and Harms Bros., Sacramento, Calif 209,427
10. David A. Richardson, Santa Cruz, Calif 218,512

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Excavation, common, for canal	119,000 c. y.	$0.28	$0.25	$0.16
2. Excavation, rock, for canal	1,000 c. y.	1.00	.50	.70
3. Excavation, for core banks	500 c. y.	.28	.25	.13
4. Excava., common, for stripping dike founds. and borrow pits	35,000 c. y.	.28	.20	.16
5. Excavation, for cut-off trench	14,000 c. y.	.28	.22	.14
6. Construct dike embankments	87,500 c. y.	.28	.28	.40
7. Paving on dikes	13,000 s. y.	2.50	3.50	3.50
8. Gravel surface on dike crests	1,530 c. y.	2.75	3.00	4.75
9. Excavation, common, for struct	13,500 c. y.	.75	.60	.52
10. Excavation, rock, for structures	200 c. y.	1.25	.60	2.00
11. Backfill	13,860 c. y.	.25	.25	.40
12. Puddling or tamping backfill	1,400 c. y.	1.00	.75	1.00
13. Concrete in structures	980 c. y.	32.00	32.00	35.10
14. Placing reinforcement bars	132,000 lb.	.03	0.425	.04
15. Dry-rock paving	700 s. y.	3.00	4.00	3.90
16. Erecting timber in structures	66 Mbm.	40.00	60.00	44.30
17. Install elastic joint-filler mat'l	40 s. f.	1.00	1.00	.15
18. Install rubber water stops	25 l. f.	1.50	1.00	1.00
19. Install gates and gate hoists	26,000 lb.	.10	.10	.10
20. Install miscellaneous metalwork	2,000 lb.	.25	.20	.15

Schedule No. 2

PARTIAL LIST OF BIDDERS:

1. A. Teichert & Co., Sacramento, Calif. (low bidder) $456,307
2. H. Earl Parker, Marysville, Calif 477,260
3. Winston Bros. Co., Los Angeles, Calif 478,110
4. Mittry Bros. Constr. Co., Los Angeles, Calif 497,475
5. Guy F. Atkinson Co., San Francisco, Calif ..... 51[illegible]
6. J. E. Haddock, Ltd., Pasadena, Calif ..... 51[illegible]
7. David A. Richardson, Santa Cruz, Calif ..... 51[illegible]
8. Larsen Bros. and Harms Bros., Sacramento, Calif ..... 53[illegible]
9. Clyde W. Wood, Inc., Los Angeles, Calif ..... 55[illegible]
10. Rhoades Bros. and Shofner, Los Angeles, Calif ..... 55[illegible]

Item	Quan.	Unit Prices (1)	(2)
1. Excavation, common, for canal	638,000 c. y.	$0.16	$0.25
2. Excavation, rock, for canal	6,000 c. y.	.70	.25
3. Excavation, for core banks	72,000 c. y.	.10	.285
4. Overhaul	318,000 sta. c. y.	.01	.01
5. Compacting embankments	62,000 c. y.	.09	.10
6. Excav., common, for drainage channels and dikes	62,000 c. y.	.86	.25
7. Excav., rock, for drainage channels and dikes	500 c. y.	2.00	.50
8. Excavation, common, for structures	60,000 c. y.	.62	.50
9. Excavation, rock, for structures	500 c. y.	2.00	1.00
10. Backfill	40,000 c. y.	.40	.25
11. Puddling or tamping backfill	4,000 c. y.	1.00	.75
12. Concrete in structures	4,900 c. y	35.10	32.00
13. Placing reinforcement bars	700,000 lb.	.04	.0425
14. Dry-rock paving	4,000 s. y.	3.90	5.00
15. Erecting timber in structures	185 Mbm.	44.30	60.00
16. Place asphalt plank on bridge floors	7,700 s. f.	.20	1.00
17. Install elastic joint-filler mat'l	40 s. f.	.15	1.00
18. Place metal water stops in joints	12,000 lb.	.10	.10
19. Install blow-off valves and connections	2,400 lb.	.15	.20
20. Install gates and gate hoists	14,000 lb.	.10	.10
21. Install miscellaneous metalwork	5,700 lb.	.15	.20

HIGHWAY BRIDGE, ARKANSAS

OWNER: Arkansas State Highway Dept., Little Rock.

PROJECT: Reinforced-concrete bridge over Illinois Bay[illegible] on Scottsville-West County Road, Pope County, Ark. T[illegible] reinforced-concrete deck girder spans and steel truss sp[illegible] are included in the 403-ft. long structure. Steel truss spans [illegible] be moved from another location. Contract includes removal [illegible] existing spans and erecting the truss spans.

CONDITIONS: Contractor to furnish all materials exc[illegible] steel truss spans and complete work in 180 working da[illegible] Highway transportation facilities available. Wage rates spe[illegible] fied are: skilled labor, $1.00 per hour; semi-skilled, 6[illegible] and common labor, 40c.

BIDS: Three bids were received March 28, 1944, rangi[illegible] from the contract low of $35,717 to $45,274.

LIST OF BIDDERS:

1. A. C. Campbell Co., Shreveport, La. (contract) ..... $35,7[illegible]
2. Reynolds & Sutton, Tyler, Tex ..... 41,6[illegible]
3. J. P. McNulty, Pine Bluff, Ark ..... 45,2[illegible]

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Geubbing	2.6 ac.	$100.00	$150.00	$200.[illegible]
2. Clearing	1.7 ac.	100.00	100.00	200.[illegible]
3. Solid rock excavation	179 c. y.	5.00	2.80	1.[illegible]
4. Common excavation	1,122 c. y.	.60	.80	1.[illegible]
5. Dry excavation for structures	162 c. y.	2.50	5.00	4.[illegible]
6. Wet excavation for structures	94 c. y.	8.00	15.00	4.[illegible]
7. Solid rock excav., structures	47 c. y.	10.00	20.00	4.[illegible]
8. Embankment material	8,352 c. y.	.65	.80	1.[illegible]
9. Class A conc. for bridges	136.87 c. y.	35.00	50.00	30.[illegible]
10. Class S conc. for bridges	156.20 c. y.	35.00	50.00	30.[illegible]
11. Reinforcing steel	42,607 lb.	.065	.07	.[illegible]
12. Concrete piling	486 l. f.	5.00	7.00	1.[illegible]
13. Concrete railing	414 l. f.	5.00	2.50	4.[illegible]
14. Metal bearing and roadway expansion devices	4,284 lb.	.24	.25	.[illegible]
15. Untreated bridge timber	9.636 Mbm.	150.00	150.00	100.[illegible]
16. Treated bridge timber	11.2 Mbm.	210.00	225.00	200.[illegible]
17. Class A. concrete	3.36 c. y.	50.00	40.00	30.[illegible]
18. Class B concrete	1.58 c. y.	50.00	40.00	30.[illegible]
19. Reinforcing steel	432 lb.	.10	.10	.[illegible]
20. 24-in. rein. conc. pipe culvert	32 l. f.	4.00	4.00	4.[illegible]
21. Riprap	265 c. y.	9.00	3.50	10.[illegible]
22. Remove exist. bridge and erecting truss spans	Lump Sum	1,500.00	1,500.00	5,000.[illegible]

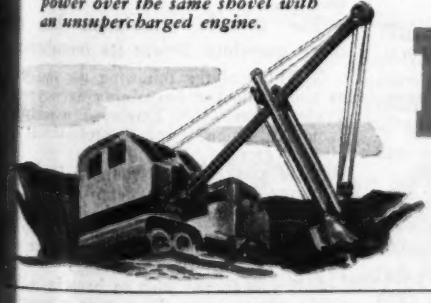
The Riveter's Helper Runs a *Supercharger*

The principle of supercharging has been indispensable to the progress of mankind from the earliest times. The working of metals into useful articles began when means were found to produce high temperatures in a charcoal fire by increasing the rate of delivery of air. The ancients accomplished this by having two or more helpers teeter back and forth on bag blowers. Today, the riveter's helper gets his rivets red hot by turning a centrifugal blower geared to produce a strong blast.

Blowing air under pressure into the cylinders of a diesel, gas, or gasoline engine is another and more advanced application of the basic principle of supercharging. In one case the resulting higher rate of combustion of the fuel produces a hotter fire — in the other it develops more power per piston stroke.

McCulloch has pioneered in the application of supercharging to internal combustion engines. Our engineers are at your service in designing engines for supercharging as original equipment or for later application.

The power shovel with a supercharged engine has a 25% to 40% reserve of extra power over the same shovel with an unsupercharged engine.



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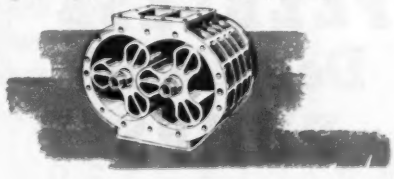
DIVISION OF BORG-WARNER

The McCulloch Positive Displacement Supercharger is closely sealed and precision-built for efficient and reliable operation.



33 times the weight of this building

LIFTING
10 MILLION TONS
of water annually

A good pump has to take a lot of punishment. For instance, take an average size Peerless Pump producing 5000 gallons of water per minute, lifting it from a deep well, 75 feet straight up. That's a lift of over 1200 tons per hour. In one year this pump lifts 10,957,000 tons. That's a lot of lifting. No wonder so many cheaply-built pumps fail. It takes a Peerless to stand up under such a load, year after year. Peerless precision is worth the effort. Peerless stamina is insurance of economical pump life.

PEERLESS PUMP DIVISION
Food Machinery Corporation
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1250 Camden Ave., S.W. Canton 6, Ohio
OTHER FACTORIES: San Jose 5, Fresno 16, Calif.

PEERLESS
Deep Well
PUMPS

NEWS OF THE WEEK

(*Continued from page 73*)

British Columbia to build Alaska road connection tion

A 247-mile connecting route from Canada's highway system at Prince George, B. C., to the southern terminus of the Alaska Highway at Dawson Creek, B. C., will be started this year, according to a recent statement by Premier John Hart to the British Columbia legislature. The highway, starting west of the Rocky Mountains, will run north and east from Prince George, crossing the range at Pine Pass. There is no present road connection at the south end of the Alaska Highway except a 500-mile ungraded road following the Northern Alberta R.R. between Edmonton and Dawson Creek.

The premier stated $250,000 will be spent immediately for locating the project and for construction to be done this year. Included in the project is rebuilding 165 miles of existing road out of Prince George and construction of 157 miles of new route. The highway will carry a 20-ft. graveled surface, and all bridges will be of permanent construction.

This action, declared Premier Hart, does not fully settle the question of a British Columbia-Yukon-Alaska highway. A report of the Alaska Highway Commission, issued in 1941, recommended a route following the trench between the Coast Range and Rocky Mountains from Prince George north to Watson Lakes via Finlay Forks. For military purposes the south section of the Alaska Highway was located east of the Rockies. If and when traffic between British Columbia and the Yukon and Alaska warrants the shorter route, it will have to be built. In the meantime, the proposed connection between Prince George and Dawson Creek will give the rapidly expanding Peace River Block a needed highway outlet.

The total estimated cost of this project is set forth in the brief as $23,709,300 of which it is estimated labor costs would be $14,677,400 of which portion approximately 50% would be spent in labor secured from local sources and 50% on labor from outside sources.

The brief points out that this is a project where surveys and plans should be very carefully prepared and supplies brought in in the fall and winter so that work on the sections selected for each summer's activities can be pressed forward to completion in a single se By repeating this process annually, estimated that the whole project c be completed in five years.

• • •

Ontario engineers stu collective bargaining

An analysis of the opinions of e neers in Ontario on the subject of lective bargaining has been begun the Association of Professional E neers of the Province of Ontario as of a national study to be made by e neering organizations in Canada.

In February the Canadian gov ment issued an order-in-council u the War Measures Act which made lective bargaining obligatory for employees in specified industries. S sequently, the Ontario legislature m the order applicable to all industr except farming, domestic service certain classes of civil service. As law appeared to cover engineers der the term "employee", the E neering Institute of Canada and provincial associations applied to Wartime Labor Relations Board for exemption of engineers for a six-mo period in order to give engineers opportunity to determine whether t wished to be included. As a result, board excluded engineers employed a professional capacity for six mo on the grounds that they are in a c fidential relationship to manageme That exemption order will be revie at the end of six months in the light information laid before the board the engineers of Canada.

Exemption of persons employed i professional capacity from the pro sions of this order was reported in *E* May 18, p. 724, but that report w incomplete in that it did not indic that the exemption is only for months.

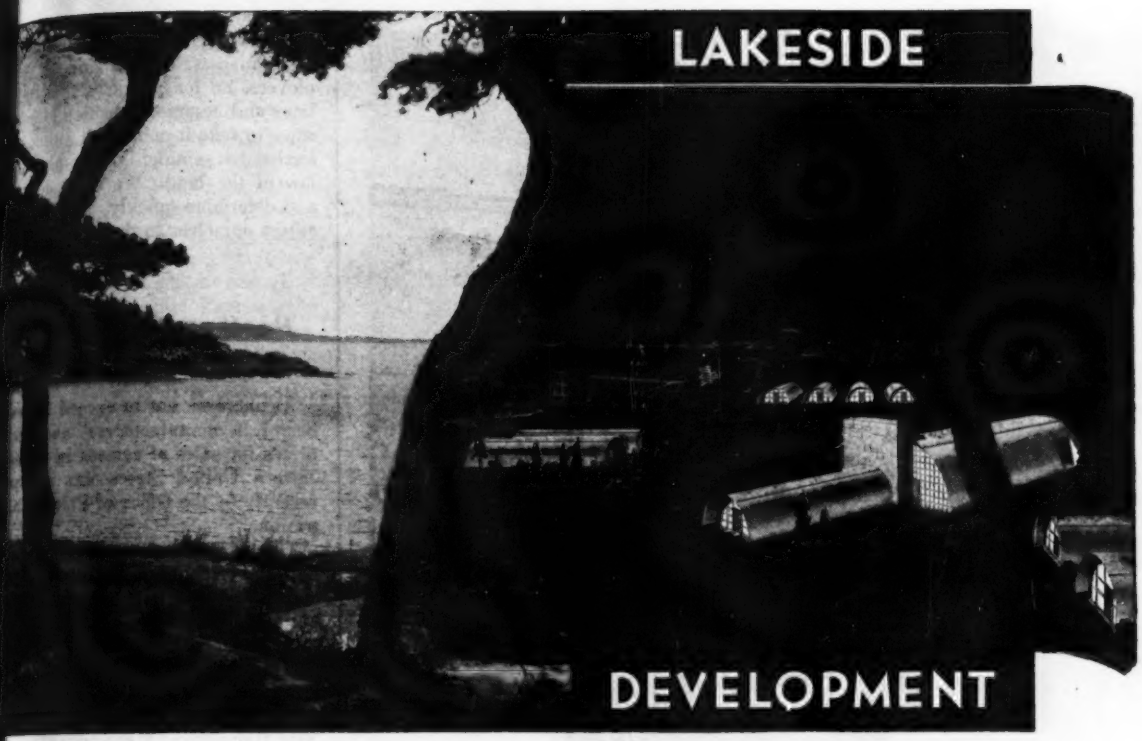
The Ontario association has these questions before its members:

1. Which of the following do you w as your collective bargaining agency: Trade union; (b) Employee associati (company union); (c) A professional gineers' group.

2. Do you consider yourself to be employee engineer (as defined under recent order-in-council, P.C. 1003)?

3. Are you willing to joint a group professional engineers constituted for purpose of collective bargaining?

4. If you do not wish to bargain coll tively, please write down your alterna suggestions.



The range of usefulness of Stran-Steel framing systems by no means ends with industrial and municipal buildings, multiple dwellings, group housing projects and other large units . . . but extends into the field of smaller structures—cottages, boat houses, cabins, summer houses and the like.

This light-gauge steel has certain characteristics which serve equally well in all types of construction. It forms a rigid framework which will not sag—resists termites and dry-rot—and is light-weight enough to handle easily in transporting and erecting. A special patented nailing groove for applying collateral materials, plus other unique advantages, makes possible economies of time, labor and materials. As a structural medium, it is flexible and adaptable—affording the architect wide latitude in design.

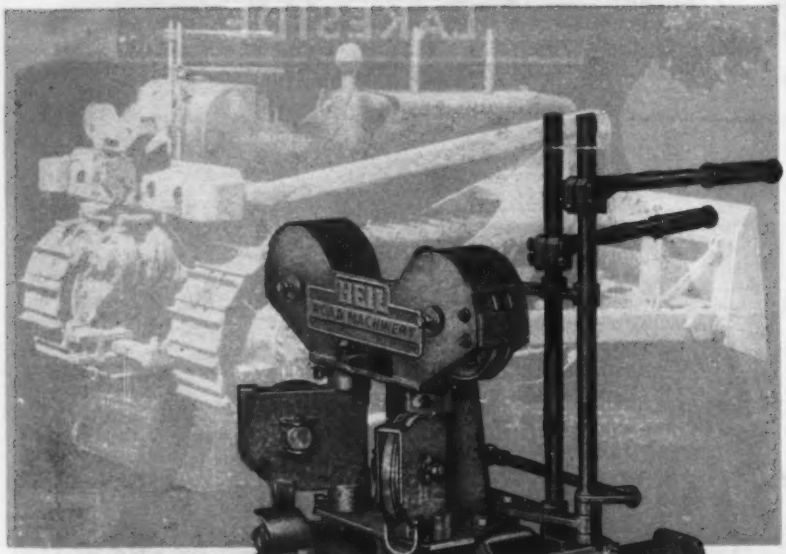
Current production of large and small military buildings combines with this company's broad peacetime activities to provide a fund of specialized experience on which the construction industry may draw in developing its postwar plans.

Manufacturer of the U. S. Navy's Famous Quonset Hut

STRAN-STEEL

DIVISION OF GREAT LAKES STEEL CORPORATION, 1130 PENOBSCOT BUILDING, DETROIT 26, MICH.

UNIT OF NATIONAL STEEL CORPORATION



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- *Fully automatic brake action*
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Available separately for cable-scraper operation with all makes of tractors

Many features have been provided in Heil Cable Power Control Units to assure increased output and reduced operating expense. The smooth-operating brake and clutch assemblies eliminate shocks and jerks; the large drums run cool; the sheaves are designed to reduce wear on the cables. This adds up to minimum outlay for cable replacement. Fingertip control gives you lightning-fast action with little effort. For sustained high production and lower operating costs, equip your tractors with famous Heil Power Control Units.

R-29

Send for descriptive bulletins.

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In sending out this questionnaire association said: "Engineers, as ployees, no longer can sit on the lines and assume a position of indi ence—a take it or leave it attitude. lective bargaining is now part of law of the land. We must determi and determine quickly, how we wan adjust ourselves to the new condition

. . .

Northeast cement pric raised by OPA

An increase not to exceed 20 cen barrel in manufacturers' and deal prices for sales of cement in the nor eastern United States was announc recently by the Office of Price Admin tration.

The adjustment applies to standa portland cement and high-early-streng cement as well as other similar typ but excludes white portland cement, tural cement, masonry cement, a other modified types.

Now effective, the increase plies to sales made in Maine, Vermo New Hampshire, Massachusetts, Rho Island, Connecticut, New York, N Jersey; the counties of Potter, Clint Center, Huntington, Franklin, and counties located east of them in t state of Pennsylvania; Maryland, t District of Columbia, Delaware, Alexa dria, Va.; and the counties of Loudo Arlington, Fairfax, Prince William a Stafford, Va.

. . .

Sewer district must pay road damage, says court

Circuit Judge Amandus Brackm of St. Louis County, Mo., has issue writs of peremptory mandamus direc ing two sanitary sewer districts in th county to provide for payments of a estimated $85,000 in repairs to stree allegedly damaged in connection wi the installation of sewer lines.

The St. John's-Overland district wa directed to post cash or surety bonds t cover $70,000 in such repairs, and th South Lackland district was ordered t post $15,000 in cash or surety bond Both have been ordered to certif before the County Court for a tax le sufficient to cover the cost of the repairs

The sewers were constructed as WPA projects and both districts built u "credits" with the WPA sufficient to pa the cost of the street repairs. These we obtained because the WPA used equip ment belonging to the districts, but th discontinuance of the WPA wiped ou the credits and the districts' applica tions for the funds are still on file i Washington, according to Robert Stan ton, attorney for the two districts.

ermont's flood protest pposed in committee

nator Overton of Louisiana, chair- of the Senate Commerce Committee subcommittee hearing testimony flood control, on June 1 expressed self as opposed to deciding question ting to flood control on a regional is, as has been proposed by citizens Vermont in opposing the construc- of the Williamsville Dam on the t River to control floods on the er Connecticut River. Flood con- said Senator Overton, is a national igation under which Congress has consider the general welfare. A ject proposed for a county or a e, he added, may be of no benefit ally—in fact, it may be definitely naging—and yet may be of great efit to counties or states down- eam.

"There are no flood control projects h dams that don't effect some local ions adversely," he declared. "Un- we are willing to admit this we have to omit flood control so far reservoirs are concerned. . . .We n't stand idly by and do nothing to event floods because of local objec- ns, and then turn around and make propriations for relief of the people o have been wiped out by flood." The project on which testimony was ng heard has already been authorized, t the war has postponed its construc- n. Now the Corps of Engineers ems to have a higher dam author- d, in order to make power develop- nt possible at some later date.

In commenting on the project, Sena- Overton took occasion to compli- nt the Corps of Engineers when its oposals in connection with the work re questioned. "Congress," he said, eretofore has depended on engineer- g advice on where to locate projects," said, "and I'll say this, that the rps of Engineers is the finest in the rld." He added that the corps, over period of more than a hundred years, s rarely made mistakes in dealing th problems.

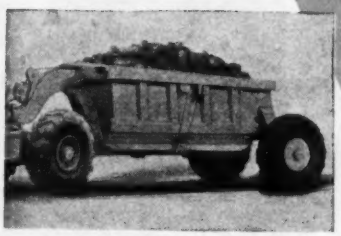
• • •

Colorado River water assured for San Diego

San Diego, Calif., by an overwhelm- g majority, has voted to establish a ter authority, which will have power direct and finance a program to ovide facilities for bringing in the 0,000,000 g.p.d. of Colorado river ter allocated to San Diego County. epresentat-es from San Diego and e various other cities and districts volved will be directors of the author- which will become a state agency.

HEIL
BULLDOZERS
(tailor-made to Cletrac Tractors)

have the rugged strength ... perfect balance ... full visibility that enables you to move more
PAY DIRT
every hour ... every day at substantial savings



A Bottom-Dump Trailer Wagon that is breaking all the SPEED records.

High-clearance doors that operate on the clamshell principle, enable your operator to dump and get away in a flash. The doors are *power-opened* — in 2 seconds — under cable control (they *close* by gravity). No doors dragging in the dirt — nothing to slow up the unit. The operator turns off the windrow at sharp angles whenever he chooses — dumping is under fingertip control — all in one heap, or with an even spread that looks almost like the work of a cable scraper. Get a post-war "priority" by ordering now!

Write for bulletins

Sound engineering design, reduced to the utmost simplicity, guarantees few service interruptions and cuts maintenance costs.

Note the operator's unobstructed view and the convenience of the controls that enable him to work accurately with no loss of speed. See how Heil engineers have pioneered the modern practice of replacing heavy cast members with welded box sections that are lighter, stronger, and easy to repair in the field without costly delays.

For full loads and more yardage — at lower cost—use Heil Earth-moving equipment. *Write for bulletins.* R-30

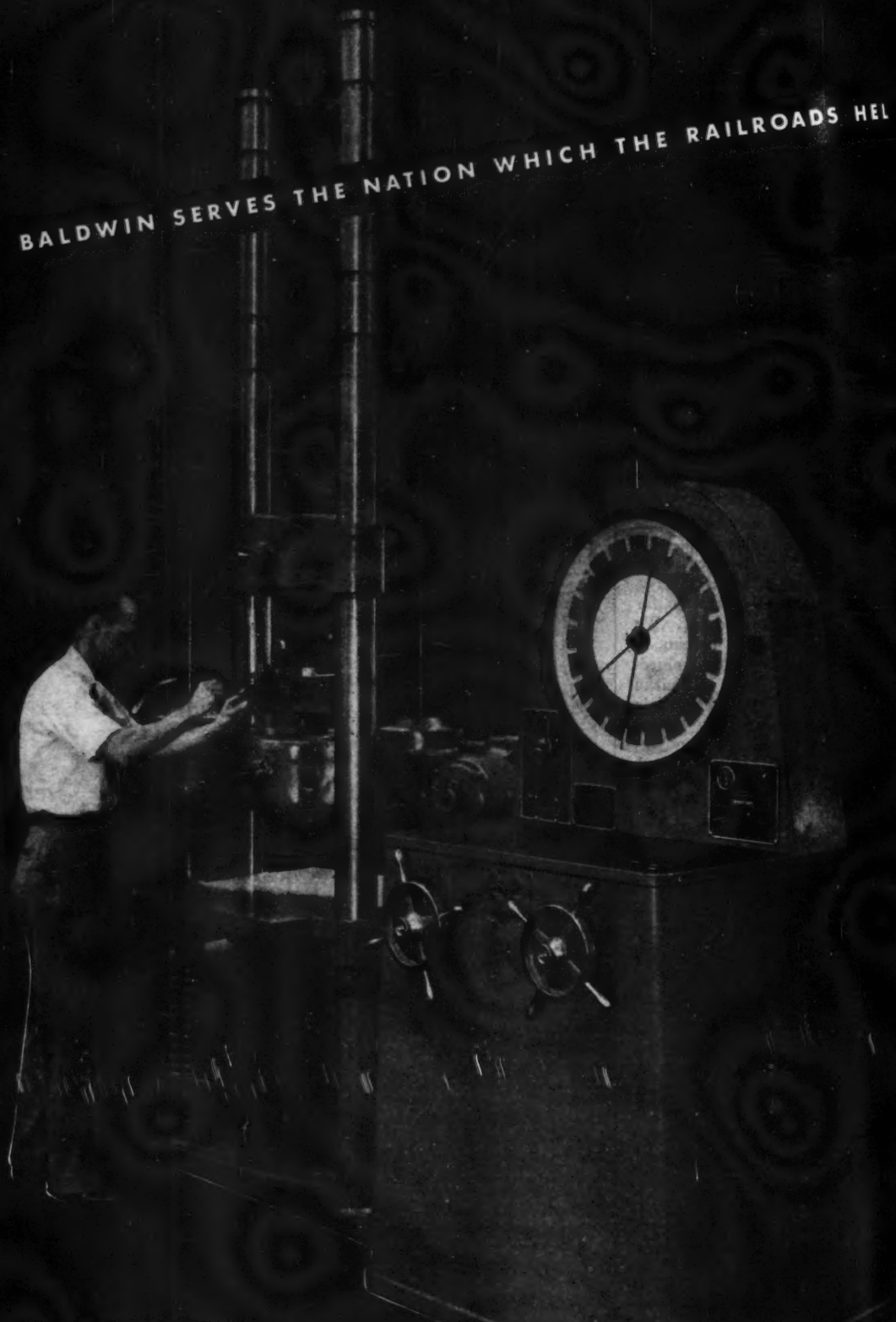
See Your Cletrac Tractor Distributor

ARMY E NAVY

THE HEIL CO.

GENERAL OFFICES • MILWAUKEE 1, WISCONSIN

BALDWIN SERVES THE NATION WHICH THE RAILROADS HEL

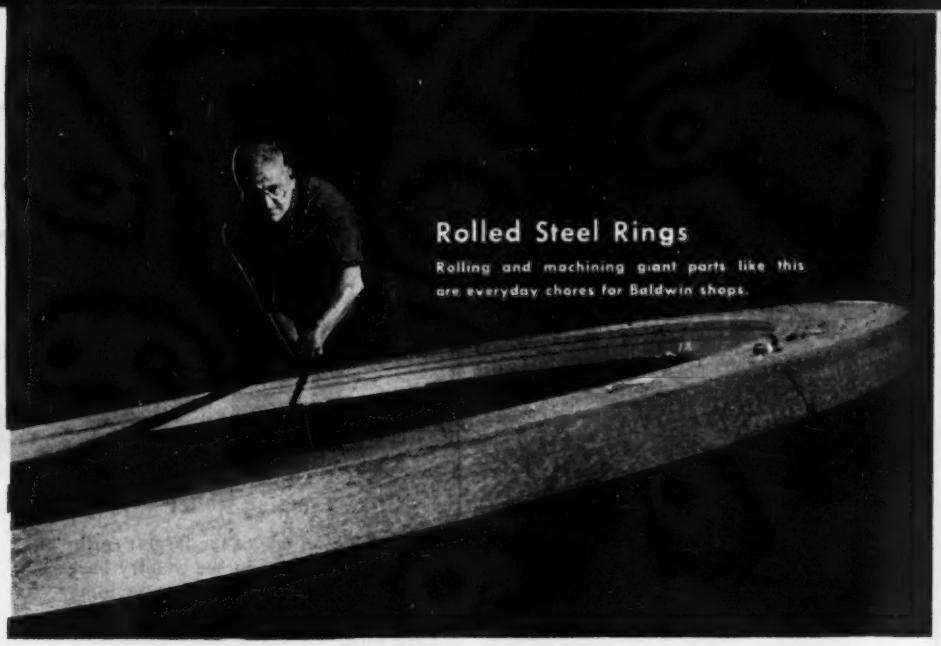


Testing Machine

No job too big, no determination too precise, for Baldwin Testing Machines. Universal models (illustrated) up to 60,000 lbs. Others up to 10,000,000 lbs.

BUILD

HEL



Rolled Steel Rings

Rolling and machining giant parts like this are everyday chores for Baldwin shops.

This, too, is a BALDWIN

When the war ends, the engineering field will leave one of the biggest jobs in history behind . . . and will find an ever bigger job ahead. The backlog of deferred projects, the new projects planned to cushion demobilization, will call for the best in men . . . *and in equipment.* Baldwin can help at every step in the job, with precision testing machines for the laboratory . . . castings and forgings . . . presses . . . industrial locomotives . . . and finished equipment, such as giant hydraulic turbines. It's not too early to make your plans . . . and it's not too late to include *Baldwin equipment.* The Baldwin Locomotive Works, Philadelphia, Penna., U.S.A. Offices: Philadelphia, New York, Chicago, Washington, Boston, Cleveland, St. Louis, San Francisco, Houston.

DIESEL ENGINES
HYDRAULIC TURBINES
BRONZE CASTINGS
REGULATOR VALVES
BALDWIN PRODUCTS
Hydraulic turbines, Water works control valves, Testing equipment, Steel forgings and castings, Bronze castings, Heavy machine work, Valve control mechanism, Diesel engines, Diesel-electric locomotives, Metal plate fabrication, Water wheels, Hydraulic power machinery, Rolled steel rings, Hydraulic gate, plunger and butterfly valves.
BLW
THE BALDWIN GROUP

BALDWIN

The Baldwin Locomotive Works, Philadelphia, Pennsylvania: Locomotive & Ordnance Division; Baldwin Southwark Division; Cramp Brass & Iron Foundries Division; Standard Steel Works Division; Baldwin De La Vergne Sales Corp.; The Whitcomb Locomotive Co.; The Pelton Water Wheel Co.; The Midvale Co.

WYTEFACE
"A"
TRADE MARK
STEEL TAPES

GRADUATED IN INCHES OR TENTHS

EASY-TO-READ, *raised* black graduations on crack-proof white surface . . . resist abrasion from rock, sand, scraping over rails, pipe, concrete, etc. In all sizes and types—in cases or reels. Ask your dealer—or write for catalog.

EST. 1867
KEUFFEL & ESSER CO.
NEW YORK • HOBOKEN, N. J.

NEW AIDS TO THE CONSTRUCTOR

Tamping Roller

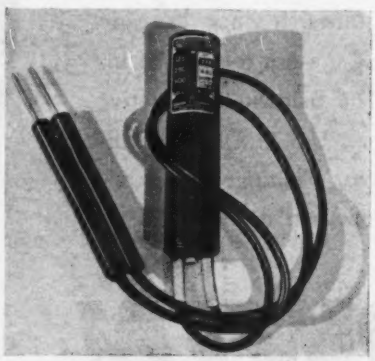
The ideas of one of the largest earth-moving contractors in the country have been incorporated in a new tamping roller. Loaded with water, this Gebhard roller gives a bearing pressure of 685 lb. per sq. in.; two complete rollers (4 drums in all) may be handled by one D-8 tractor.

The feet of the roller are wedge-shaped solid steel billets, hard surfaced. The 10-in. ship channel frame is made in two halves, hinged in the middle to allow each roller to follow undulations in fill. Cleaner bars of 2x3-in. steel are set at an angle to "peel" mud from the drum as near the ground as possible, which is said to reduce draft.—*Shovel Supply Co., P. O. Box 1369, Dallas 1, Texas.*

• • •

Lampless Voltage Tester

Positive voltage identification, distinction between A.C. and D.C., and testing without lamps, it is claimed, are possible with a new voltage tester. The device is in a cylindrical fiber case, easy to grip and practically unbreakable. The 4-in. fiber grips on the leads give



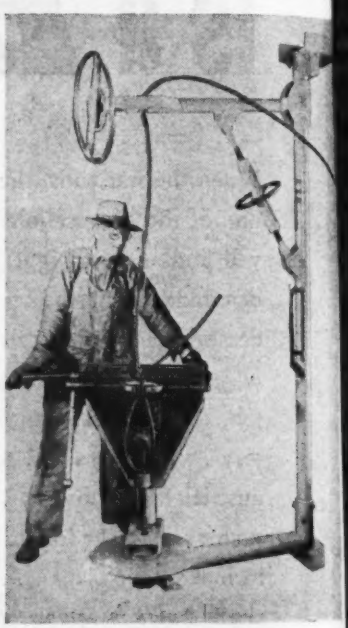
complete insulation, and the 24-in. leads of flexible wire have a double thickness of rubber insulation vulcanized to the wire to prevent slipping. Sharp spear points on the leads permit piercing of wire insulation without damage.

The tester has A.C. voltage markings of 110, 220, 440 and 550; D.C. ma[r]kings are 125, 250 and 500.—*Square Co., 6060 Rivard St., Detroit 11, Mic[h.]*

• • •

Cable Splicing Rig

Structurally self-contained, a ne[w] Gar-Bro cable splicing rig may be s[et] up, bolted to a column or post, or lashe[d] to a tree, and working in ten minute[s]



according to the manufacturer's announcement. The unit may be either vertically or horizontally mounted by means of mounting pads, and for compactness and handling ease, the top and bottom members are detachable. Its overall size, set up, is 96 x 45 in., and it weighs approximately 250 lb.

This unit is said to have equal use as a portable or a permanent installation.—*Garlinghouse Brothers, 2146 East 16th St., Los Angeles 21, Calif.*

• • •

Gas Mask

Two new model gas masks—Standard and Model S—have been added to

Speaking of Speeds

ADAMS MOTOR GRADERS *Have* THEM

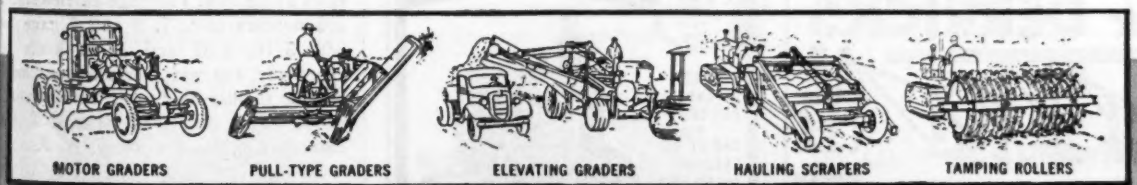
One of a series of ads on Adams motor grader features

AVAILABLE working and travel speeds have a lot to do with what you can accomplish with a motor grader in a day whether it be on construction work, maintenance or snow plowing . . . First, you want a motor grader that will travel to the job quickly. Adams Motor Graders have high travel speeds which cut down travel time . . . When you get on the job you want to make each cut at the fastest practical speed. Adams wide and flexible range of working speeds permits you to get the fastest practical speed for each cut to be made.

On surface maintenance Adams rigidity and balanced weight distribution permit maintaining at speeds higher than satisfactory with most machines. The grader pictured above is maintaining crushed stone roads at 5 to 6 m.p.h. . . . On all work, from bank to bank, Adams ease and economy of operation and quick adaptability to all kinds of cuts make Adams Motor Graders your best buy—always. Talk them over with your local Adams dealer—and use his services in keeping your present equipment rolling.

J. D. ADAMS COMPANY · INDIANAPOLIS, IND.

At war's end we'll need many new roads and many jobs for returning service men. Plan post war projects now and meet both needs.



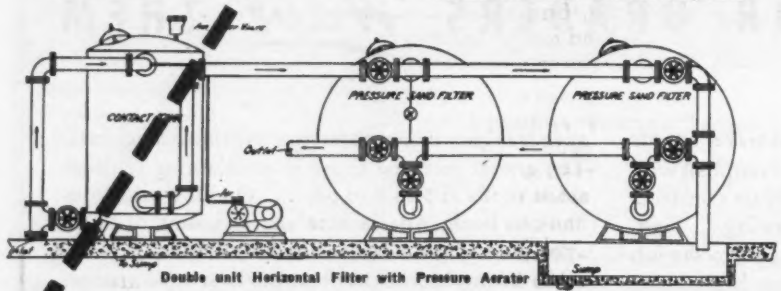
ADAMS ☆ ROAD-BUILDING AND ☆ EARTH-MOVING EQUIPMENT

For the Removal of
IRON *from Water*

Refinite
Pressure
AERATION
and
FILTRATION

In the Pressure Aeration and Filtration method, raw water is forced first into the pressure Aerator where it is thoroughly oxidized, and the iron precipitated. It then passes through a bed of contact ore in the Aerator which removes a large portion of the iron. Finally, the water goes into the pressure Filter Sand Filter where all remaining traces of iron are filtered out. The water produced by this method is clear, sparkling and free of all iron and sediment. It is used extensively by municipal and industrial plants.

For all industrial purposes, iron is extremely objectionable in water supplies because it forms stains; forms deposits which clog pipes and machinery; imparts a metallic taste; and interferes with most processing operations. The Refinite Corporation offers several types of iron removal equipment depending upon the nature of the water and the results desired. Write Refinite today for quotations and recommendations. There is no obligation.



Double unit Horizontal Filter with Pressure Aerator

The Refinite Corporation
102 Refinite Bldg., Omaha, Nebr.

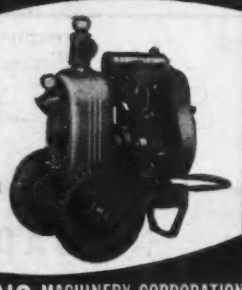
SASGEN ★ ★ DERRICKS

Complete Range of Types and Sizes Get Our Catalog

SASGEN DERRICK CO.
3101 Grand Ave. Chicago, Ill.

STERLING QUALITY

STERLING PUMPS



SIMPLE
DEPENDABLE
RUGGED
•
CHOICE OF LEADING CONTRACTORS
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WRITE FOR LITERATURE

STERLING MACHINERY CORPORATION
405 Southwest Blvd., Kansas City

the manufacturer's line, according to a recent announcement. Both of the "All-Service" masks are equipped with the "All-Vision" facepiece, which is said to afford a gas-tight seal, wide-angle vision, non-fogging lenses, comfort and freedom.

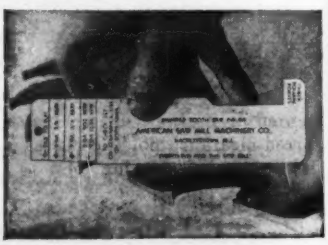
Model S has a canister containing a special filter, approved for respiratory protection against toxic dusts, fumes and smokes, as well as gases. This canister will fit in the Standard model carrying case by removing a small stop at the bottom of the case.—*Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh, Pa.*

• • •

Inserted Tooth Saw Gage

Convenient and small, a new 6½-in. polished steel, inserted tooth saw gage is available, gratis, to any sawmill operator requesting it.

The gage is notched and marked so that saw bits can be instantly squared with the saw; each bit should project the same distance on each side of the saw, and should be checked on both sides of the saw. The gage carries standard notches of 6, 7, 8 and 9 gage for 3/8, 5/16, 9/32 and 17/64 kerfs respectively, but wider or narrower kerfs may be readily filed to fit the operator's needs.—*The American Saw Mill Machinery Co., Hackettstown, N. J.*



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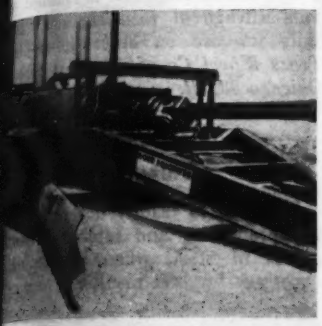
High-Capacity Roadmixer

Featuring a high mixing capacity, the new Model 54 Wood Roadmixer has a 54-in. dia. mixing drum. This larger size drum not only cuts down friction

istance within the drum, it is as-ed, but also enables the handling windrows up to 8 cu.ft. Because fewer drows per job are required, an ob-



on saving in time is pointed out. The new machine has a power lift, ose four hydraulically operated jacks ovide quick lifting of drum and ting blades. Larger plungers on the ks make possible fast and easy ap-ication of cutting blade to grade.—*od Manufacturing Co., 816 West 5th , Los Angeles 13, Calif.*

• • •

Ratchet Wrench

Designed for difficult nut-running in se quarters, a number of innovations pear in a new pneumatic ratchet ench. The side plates are milled with ots the entire length for accurate ignment and socket support. The

ench nose, of heat-treated, strong, ght-gauge stock can be inserted in all spaces, while two ratchets and o compression springs give double rength to the pawl.

The wrench, available in three sizes, as a head clearance not exceeding ½ , and handles nut-running jobs from to ¾ in.—*Keller Tool Co., Grand aven, Mich.*

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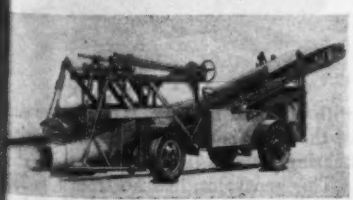
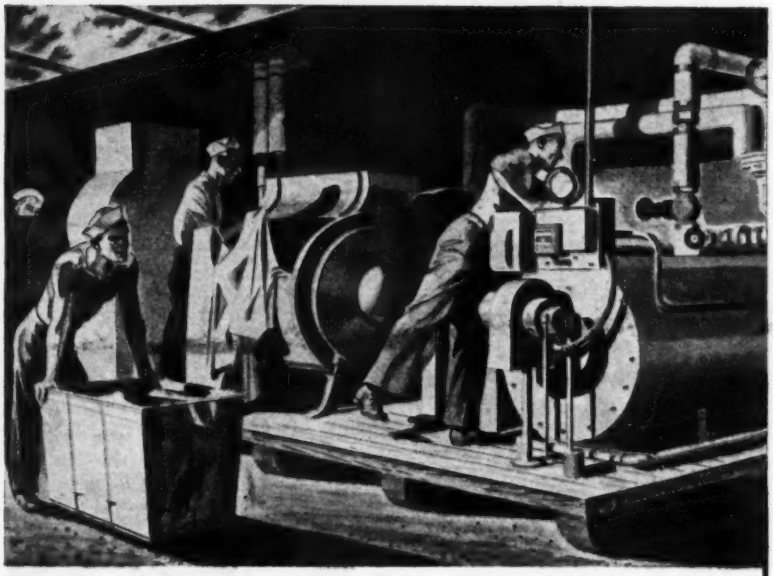
Force-Feed Loader

One-man operated and self-propelled, new force-feed loader is said to have any highway maintenance uses. In



ddition to loading surplus earth, rock, ll mix, etc., into trucks for removal,



PORTABLE AND PERMANENT;
Wood Meets Both Requirements

LAUNDRY EQUIPMENT for advanced military bases has to be portable. Grouping it in small units, and mounting it on wood bases and skids, make moving easy. That wood must be highly resistant to decay and termites, to provide a permanent, firm foundation, and to maintain alignment of shafting and machines. Wolmanized* Lumber takes care of those requirements.

SPOT THAT laundry equipment wherever fighting is going on—anywhere in the world—and that wood will hold up. Vacuum-pressure impregnation with Wolman Salts* preservative accounts for its durability. Millions of feet of this treated wood in service before the war, millions more during the war, testify to its durability.

MINALITH*-TREATED wood—flameproofed—is proving similarly valuable to the war effort. Blimp hangars, warehouses and the like are safeguarded against fire, helping to preserve their usability in the face of extraordinary hazards. Wood treated with Minalith fire retardant will not catch fire. It will not spread fire.

ALL OF TODAY'S production is, of course, going into war work. But Wolmanized Lumber and Minalith-treated Lumber will be available for your postwar use. With either type of treatment, all of the usual advantages of building with wood are retained—lightness, ease of handling and erection, strength, resilience, high insulation value. American Lumber & Treating Company, 1649 McCormick Building, Chicago 4, Illinois.

*Registered trade marks

WOOD THAT'S *Alloyed* FOR SAFETY AND ENDURANCE

AMERICAN LUMBER & TREATING COMPANY

TEETH
that are shaped
for their job . . .
By comparing various animals you see how accurately their teeth are shaped to meet their individual need. Gear teeth, like natural teeth, work at their best when they, too, are shaped to fully meet the job they have to do.
As the result of extensive research and field testing, Fuller developed gear teeth which are shaped differently from ordinary gear teeth—shaped to do their job better. That's why Fuller Gears give you a transmission which has become notable for its quiet running—its easy shifting—its long wear-life. Be sure the transmission in your new truck is a FULLER.
FULLER MANUFACTURING COMPANY, KALAMAZOO, MICHIGAN
Transmission Division
Unit Drop Forge Division, Milwaukee, Wisconsin
Fuller
TRANSMISSIONS

ELECTRICAL CORROSION CONTROL

Used on hundreds of tanks from coast to coast, Rusta Restor,—the proven cathodic (i.e. electrical) method maintains steel tanks in an "electronegative" state that not only prevents rusting but gradually removes the effect of any earlier rusting.

Rusta Restor is modest in first cost and uses the current required by only one light bulb,—at safe low voltages. Each installation engineered to the individual tank and water conditions. Electrode or the more newly developed electrode-less type that avoids any fouling due to icing. Detailed description of interest to engineers and operating men sent on request. Write to-day.

RUSTA RESTOR
Division of
THE JOHNSTON & JENNINGS CO.
860 Addison Rd. Cleveland 14, Ohio

the loader, operating as a compani piece to the manufacturer's mo grader, will remove windrows of deb thrown out from ditch cleaning.

Use of this loader, it is claimed, p mits salvage of road surfacing ma rials for use on other jobs.—*Ath Truss Wheel Co., 5631 West 65th S Chicago 38, Ill.*

• • •

Calculator

Designed to readily determine we ing preheating and interpass temp atures of steel, when preheating necessary for best results, a new ca

board calculator has been devised four movable sections of heavy car board stock.

The calculator is 6¼ in. in diamete with 6-step instructions printed on th outside sections. It is priced at 25 cent postpaid, anywhere in the Unite States; 50 cents elsewhere.—*The Lin coln Electric Co., Cleveland, Ohio.*

• • •

Gas Engine Drive Generator

Constructed to bolt directly to en gine housing and shaft, a new direct current engine generator is equipped

with one ball bearing. The engine end of the rotor is supported by the engine bearing.

This generator, in sizes from 1 to 200 kw., is built for a range of 15 to 600 volts.—*Century Electric Co., 1806 Pine St. Louis, Mo.*

MANUFACTURERS' ACTIVITIES

JOSHUA HENDY IRON WORKS, Sunny-le, Calif. has appointed Jean M. Allen

draulic - dredge nsulting engi-er. Mr. Allen is ll known as a signer of dges, in the st 38 years hav- designed over of them, rang- in discharge from 6 to 30 hes. He has had ny years' experience in dredging op-tions and has had supervisory charge dredging contracts totaling approxi-tely 150,000,000 cu. yd.

Hendy is a manufacturer and sup-er of component parts for hydraulic tion and bucket-type dredges, and is uipped to build practically every rt, including steam turbines, diesel en-nes, electric motors, generators, hoist uipment, pumps, gears, etc., in its n shops.

Wallace Johnson was recently ap-

inted general les manager of endy. With an gineering as ell as a sales ckground, Mr. hnson is well ualified. He is a raduate of Cali-rnia Institute of chnology. Mor-s Levit is head of les for the Joshua Hendy division, ith C. L. Barrett as sales manager at omona division and L. T. Warner at rocker-Wheeler division.

THE CLEVELAND PNEUMATIC TOOL o of Cleveland, Ohio, is celebrating s fiftieth anniversary. Practically all its pneumatic tools, aircraft landing ear, shock absorbers for rolling stock, ck drills and other mining and con-truction machinery, are being manu-Wallace Johnson was recently ap-ctured for the war effort at the present me.

ELECTRIC SERVICE SUPPLIES Co. of hiladelphia has changed its name to lectric Service Manufacturing Co. he personnel, ownership and manu-acturing remain unchanged. Organ-ed in 1906, the company produces ass transportation equipment, power rotection devices, industrial haulage

Sizes and Models for All Lifting Jobs—Mechanical and Hydraulic Jacks

WRITE FOR BUDA JACK POCKET MANUAL

BUDA

THE BUDA COMPANY

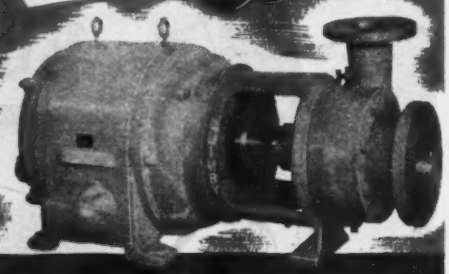
15423 Commercial Avenue • HARVEY (Chicago Suburb) ILLINOIS

Announcing

QUIMPACT

the New Quimby Close-Coupled Centrifugal Pump

QUIMBY PUMPS



- Compact, rugged, efficient, low cost.
- Hydraulically and dynamically balanced.
- Double volute construction on larger sizes to eliminate shaft deflection.
- Adjustable feet under pump frame supports pipe loads.
- Sealed shaft sleeve protects entire shaft extension.
- Sizes 1 in. to 6 in. for capacities to 1000 GPM, heads to 450 ft., temperatures to 300°F.

QUIMBY PUMP COMPANY
INCORPORATED
Division of H. K. Porter Company, Inc.
Pittsburgh, Pa. • Blairsville, Pa.
Newark, N. J. • New Brunswick, N. J. • Mt. Vernon, Ill.

Above is a Sauerman Slackline Cableway cleaning loose rock out of a hydro-plant spillway and dumping the debris on a hillside well back from edge of stream. Some 40,000 cu. yd. was removed from the spillway in a few months at a cost far below the estimate.

This Sauerman Power Scraper (1 cu. yd. size) and portable crushing and screening plant has been producing 10,000 cu. yd. of graded material a month for a county road commission for 15 years.

CUT COSTS
in moving materials

On jobs where materials are to be moved distances of several hundred feet or more, a SAUERMAN Drag Scraper or Cableway is a great money-saver.

First cost of a SAUERMAN machine is reasonable, maintenance expense is small, and the simplicity of operation permits easy one-man control of even the largest installation.

This equipment is very flexible and is readily adapted to meet new and difficult working conditions. Sizes range from small portable units designed for cheap handling of a small hourly tonnage of loose materials up to powerful machines that will move as much as 1,000 tons per hour of the toughest materials.

Write for our catalog and see for yourself how others have cut costs on hundreds of dig-and-haul jobs with Sauerman Machines.

SAUERMAN BROS., INC.
532 S. Clinton St. Chicago 7, Ill.

systems and electric shop tools. A. Englund was recently elected presi and J. R. McFarlin, secretary.

EUGENE J. REARDON has been na chief engineer of the American Ste Wire Co., U. S. Steel subsidiary, succeeding George H. Rose, appointed assistant to the vice president.

Mr. Reardon attended North Eastern University where he studied metallurgical engineering. He worked as a dra man at the Geometric Tool Co. and Winchester Repeating Arms Co., N Haven, and the Lane Construction C Gilboa, N. Y., before joining Americ Steel & Wire Co. as a machinist at New Haven works in 1922. Mr. Re don was transferred to Worces Mass., as tramway engineer in 1930. 1936 he was appointed superintende of the New Haven plant and later named general superintendent of New Haven and Trenton, N. J., plan He has been assistant chief engineer the company.

BUCYRUS-ERIE CO., South Milwauke Wis., has appointed R. R. Howell C Minneapolis, Minn., as distributor its water well drills, drilling and fishi tools. Howell will handle the Bucyr Erie well drills in Minnesota, Iow western Wisconsin, North Dakota, a South Dakota from Minneapolis.

The Howell Co. plans to stock Bucy rus-Erie well drills and complete su plies of drilling tools when conditio permit. The Minneapolis office is 31st Ave. and Fourth St. S.E. The D Moines, Ia., branch is at Third and E Streets.

CUTLER-HAMMER, INC., Milwauke Wis., has appointed G. E. Hunt actin manager of the company's Atlanta territory with offices and warehouse at 134 Marietta Street, N.W., Atlanta, Ga.

Mr. Hunt by experience is well qualified to serve customers in electric motor control and the diversified lines of electric equipment manufactured by this company. Mr. Hunt has been with Cutler-Hammer since 1920, serving in the New York, Philadelphia, Cleveland, and Milwaukee headquarters offices, and lately as manager of the Indianapol office.

here's what happens before and after Waterfoil

Today's buildings can be decorated and restored for tomorrow's competitive challenge. Masonry walls such as concrete, stucco or brick can be coated with Waterfoil, the scientific contribution to masonry protection. Waterfoil is manufactured of irreversible inorganic gels . . . non-critical materials now available. The Waterfoil coating permits the masonry to breathe, allowing the escape of water vapor. Actual water absorption inwards, however, is impeded avoiding reinforcing bar rust or spalling. If you are a property administrator or maintenance executive, send for the Waterfoil literature . . . it is very important information.

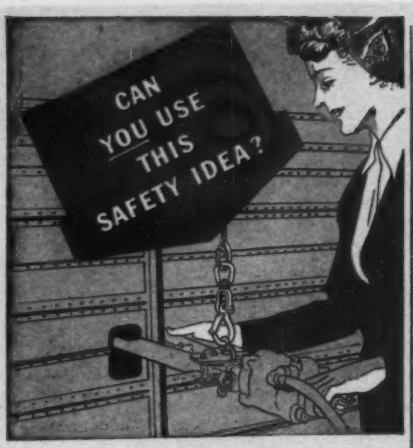
A. C. Horn Company *established, 1897*

Manufacturers of Materials for Building Construction and Maintenance
43-36 Tenth Street, Long Island City 1, New York

WATERFOIL

THE UNIQUE TREATMENT FOR EXTERIOR MASONRY SURFACES

HORN



A prominent aviation manufacturer used a Laughlin Safety Hook, as shown, as part of a riveting machine set-up purposely devised for the safety and efficiency of women war workers.

This hook's unique, stout-springed safety latch holds its burden securely despite strain or jolts. That's why workers like it — it's safer.

This latch is available on all sizes and styles of Laughlin hoist hooks.

LAUGHLIN THIMBLES: Two styles . . . regular and plow steel pattern (extra heavy for use with plow steel and high tensile wire ropes).

LAUGHLIN SWIVELS: Made in the following types: jaw and jaw, chain swivel, swivel with jaw end, swivel with swivel. Drop-forged.

Write for catalog showing the complete line of Laughlin Wire Rope Fittings

Distributed through
Mill, Mine and Oil Field Supply Houses

Look for Laughlin Products in
COMPOSITE CATALOG
Power's Road & Street Catalog

FORGING A SHARE IN VICTORY

THE THOMAS LAUGHLIN Company
PORTLAND 6, MAINE

THE PLYMOUTH locomotive used on the "Guadalcanal, Bougainville and Tokio R.R.," pictured on page 58 of the April 6 issue of *Engineering News-Record*, was rebuilt one furnished by the Equipment Corp. of America, Chicago, Ill.

Anticipating a postwar use of open steel grating as bridge decking, as landing mats for helicopters and for industrial flooring, the Irving Subway Grating Co., Long Island City, N. Y., has appointed five new district sales representatives and sales organizations in the south. H. W. Stovall, Richmond, Va.; General Marine & Supply Co., Charleston, S. C.; Illingworth Engineering Co., Jacksonville, Fla.; Leo Magnus, Memphis, Tenn.; and Rittelmeyer & Co., Atlanta, Ga.

AT A RECENT meeting of Union Carbide and Carbon Corp., Fred H. Haggerson was elected president, and Ralph R. Browning, Paul P. Huffard, and Homer A. Holt were elected to the board of directors. Mr. Haggerson has been vice president and director and has been with the corporation for 25 years. Mr. Browning has been associated with the corporation for 31 years, and Mr. Huffard for 35 years. Both have been vice-presidents since 1939. Mr. Holt is a former Governor of West Virginia. Benjamin O'Shea, president, is also chairman.

J. E. Bowen, general manager of Stran-Steel division of the Great Lakes Steel Corp., has announced that E. F. Patterson, manager of the Mansfield, O., plant has been promoted to manager in charge of all Stran-Steel plants, with headquarters at Detroit. R. L. Kretschmar, co-ordinator of production, who has been in the Detroit offices, becomes manager of the Mansfield plant.

THE SULLIVAN MACHINERY CO., Michigan City, Ind., has announced the election of J. A. Drain, Jr. as vice president in charge of product engineering, research and development. He was formerly assistant to the president, and before joining the company was president of the Stefco Steel Co.

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WAR RISK
WORLD WIDE
TRAVEL-ACCIDENT INSURANCE
IMMEDIATELY AVAILABLE in large amounts either directly or through your insurance broker in leading American insurance companies. Ask our nearest office for a copy of "Travel-Accident Insurance," sent without obligation. If your problem is urgent, phone or wire us for a quotation.
In aviation and insurance circles, PARKER & CO. has long been recognized as a pioneer in aviation, air cargo and foreign insurance.
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AVIATION AND GENERAL INSURANCE
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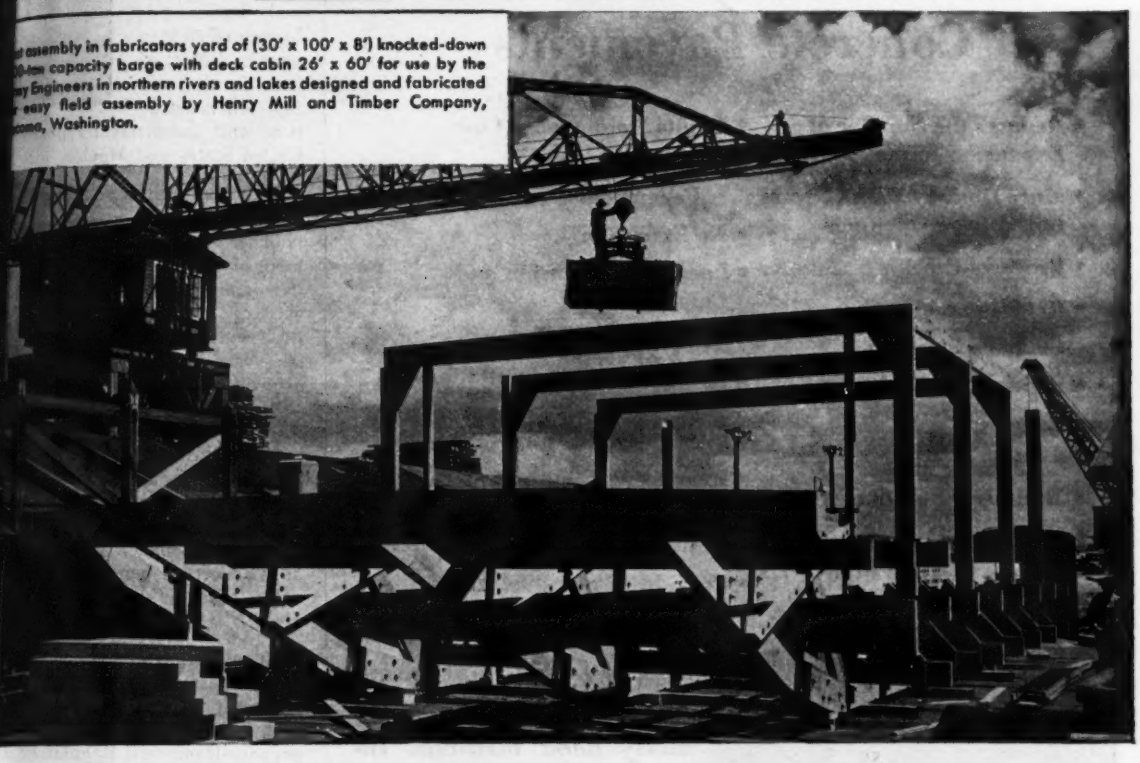
NEW YORK 17, N. Y.
MUrray Hill 2-7434

Compact!
Powerful!
DISTRIBUTABLE
with
ALL STEEL HAND HOIST
SEATTLE, U.S.A.
Money Has Been Saved on These
1200' assembled pipe (132 Tons) were lowered to bed of Mississippi at St. Paul with 9—5-Ton Beebes, three lines to each hoist through blocks.
Hudson River Bridge sidewalks were laid in sections with 32—5-Ton Beebes.
Longest wooden trusses in world were installed with ONE 5-Ton Beebe after power hoists proved impractical.
When raising, lowering, or placing costs by power are a serious problem, the answer is the number of Beebe Bros. All Steel Hand Hoists MANNED IN UNISON. Available in 2, 5 and Ton sizes. Sold through leading dealers in trade centers. List of dealers sent upon request.
BEEBE BROS., 2720 6th Ave. S., Seattle 4,
"THE STRONGEST GEARED POWER FOR ITS WEIGHT IN THE WORLD"

ACE-TIME PLANNERS CAN LEARN MUCH FROM TECO WAR-TIME METHODS



assembly in fabricators yard of (30' x 100' x 8') knocked-down ton capacity barge with deck cabin 26' x 60' for use by the ny Engineers in northern rivers and lakes designed and fabricated easy field assembly by Henry Mill and Timber Company, ma, Washington.

Experienced nation-wide timber fabricators with large productive capacity have produced thousands of large and small war jobs using the TECO connector system of timber construction.

Larger, stronger and more varied types of jobs were designed and completed than engineers and architects ever thought were possible with timber. Without TECO connectors many of these jobs could not have been constructed.

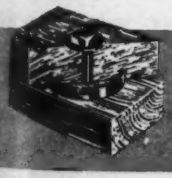
Profit by the experience gained by designers, architects and engineers who have used the TECO connector system of timber construction.

These timber fabricating plants are serving private industry in post-war planning of Clear Span Roof Trusses, Bridges, Heavy Structural Framing, Barges, Towers, Power Lines, Glued Laminated Construction, Prefabricated Housing.

TECO engineering and research staffs too are ready to help you—feel free to write or consult them about your timber designing problems.

TIMBER ENGINEERING COMPANY

WASHINGTON • CHICAGO • MINNEAPOLIS • NEW ORLEANS • PORTLAND



Specify **TECO CONNECTORS AND TOOLS**

Endorsed by Leading Lumber Manufacturers and Fabricators

Twenty-two REASONS
Why *FLEX-PLANE* Dummy Joints are Necessary in Modern Concrete Pavements

- Reduces the Number of Expansion Joints
- More Dummy Joints Divide Contraction Openings
- Prevents Cracking
- Retards Creeping
- Controls Warping
- Reduces Curling
- Relieves Stress
- Lessens Bumps
- Minimizes Pumping
- Minimizes Panning
- Lessens Deterioration
- Lowest Cost
- Limits Maintenance Cost
- Anchored in Place—Is Permanent
- No Extrusion
- Localizes Expansion and Contraction
- Assists in Normalizing the Slabs
- Ribbon Joint is Continuous in Length
- Prevents Infiltration of Water
- Increases Strength of Slabs
- Produces Homogenous Structure
- Provides Expansion Relief for the Hot Upper Part of the Slab

FLEX-PLANE joint installing machines eliminate messy hand methods. Install all types of joints . . . ribbon, poured, premoulded, etc., with or without VIBRATION.

• *Ask for Equipment Specifications* •

FLEXIBLE ROAD JOINT MACHINE CO. WARREN, OHIO U. S. A.

O. J. Neslage was elected vice
dent in charge of sales in the United States and Mexico. Mr. Neslage during the past year was general sales manager and formerly branch office manager in district offices in the mining, oil, construction, and industrial territories of United States and Mexico.

THE MARQUETTE CEMENT MANUFACTURING CO. announces the retirement of F. L. Jaeger from active service. Mr. Jaeger spent 25 of his 33 years in the cement industry with Marquette, starting as a salesman in Iowa in 1919. He was southern sales manager at Memphis 10 years and was then promoted to eral sales manager with headquar at Marquette's general offices in cago. Later he was made a vice pr dent.

APPOINTMENT of Ralph H. Metcal zone supervisor for the air condi ing controls division in the Cleve area has been announced by the M neapolis-Honeywell Regulator Co. M calf has specialized in air condition controls, having supervised their ins lation in many midwestern war pla since 1939.

LINK-BELT CO., Pacific Division, opened a sales office and warehouse Spokane, Wash., with Homer A. G land in charge.

W. A. GREEN has been made pr dent of the Builders Material Co. Fort Worth, Tex. and E. F. Gunn, retary. Green succeeds E. F. Sprin

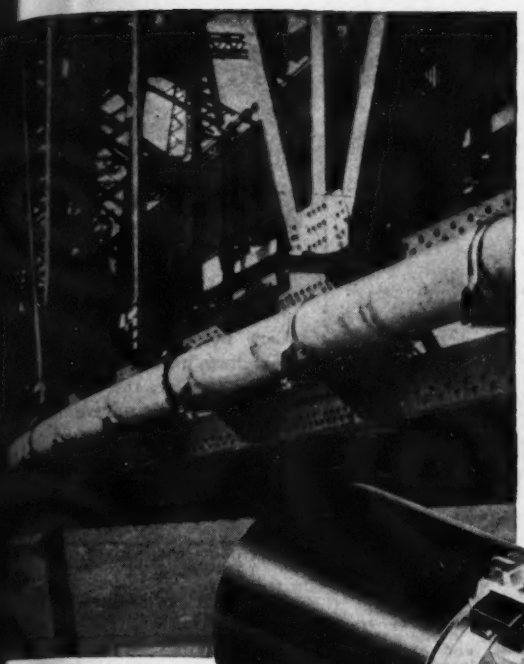
Diamond Core Drilling Contractors

FOUNDATION TESTING
Dams, Heavy Structures, etc.
STAGE SECTIONAL
PRESSURE GROUTING
Contract or Rental

MFR'S DIAMOND & SHOT CORE DRILLS GROUT MIXING MACHINES, PACKERS AND GROUT PUMPS.
MOTT CORE DRILLING CO.
HUNTINGTON, W. VA.

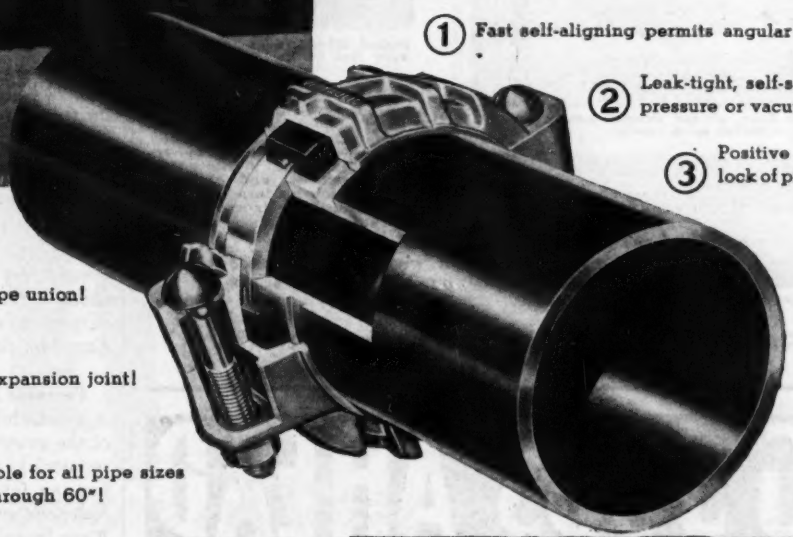
Fast, Dependable
SHOVELS, CRANES
DRAGLINES, BACK HOES
Crawler or Truck—Gas or Diesel
10 Models of ¾-⅝-½-⅜ cu. yd.
THE **BYERS** MACHINE COMPANY
RAVENNA OHIO
DISTRIBUTORS THROUGHOUT THE WORLD

LEWIS & McDOWELL Inc.
Engineers & Contractors
for
Prestressed Gunite Tanks
Gunite work in all its Branches
Waterproofing, all types
Restoration of Masonry Buildings
Synthetic Rubber and other special Tank Linings
Dam Repairs and Reconstruction
285 Madison Avenue, New York, N. Y.
Murray Hill 3-0554



The "Pipe Dream" that Worked...

Add up all the ideal specifications you'd make for a pipe coupling and what would you have? A coupling that would join two pieces of pipe together in a leak-tight joint quickly! A coupling green labor could use! A coupling that would be flexible enough so you wouldn't have to bother about accurate pipe alignment! That would give you positive mechanical lock and yet provide for expansion and contraction! The only thing about such a coupling is that . . . Brother it's no dream. It's a Victaulic. And it has more advantages than any "pipe dream" you ever had. For instance . . .



(1) Fast self-aligning permits angular deflection!

(2) Leak-tight, self-sealing under pressure or vacuum!

(3) Positive mechanical lock of pipe lengths!

(4) Every joint is a pipe union!

(5) Every joint an expansion joint!

(6) Available for all pipe sizes 3/4" through 60"!

PECIAL VICTAULIC ADVANTAGES FOR INDUSTRIAL USERS!

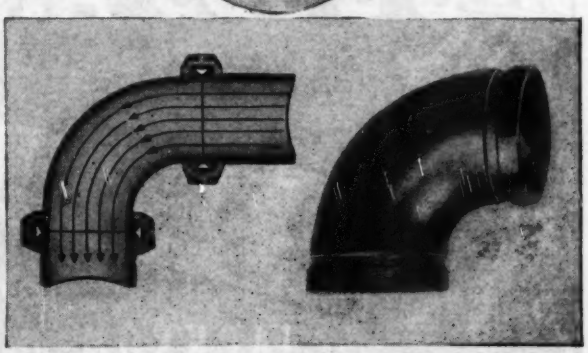
Can be installed faster and with less labor than other method!

Lower installation costs... unskilled labor can do job.

No expensive equipment needed . . . one small inch is the only tool required.

Substantial savings in space and weight.

Temporary lines can be salvaged 100 per cent. Maintenance is nil!



VICTAULIC FULL-FLOW FITTINGS. Full-flow diagram at left illustrates efficiency principle used in Victaulic 90° Elbow, long sweep . . . smooth, true-circular walls with no internal projections, no pockets. Lower frictional losses mean increased delivery, lower pumping costs. Victaulic makes all styles of fittings for every piping need. Be sure to specify "Victaulic."

BUY MORE WAR BONDS

VICTAULIC

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F-ALIGNING PIPE COUPLINGS AND FULL-FLOW FITTINGS

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NEW VICTAULIC CATALOG MANUAL

. . . a must for every firm that uses pipe. Contains all you need know about Victaulic Couplings and Full-Flow Fittings. Write to nearest address for your copy today on your firm's letterhead. Victaulic Company of America, 30 Rockefeller Plaza, New York 20, N. Y.; Victaulic Inc., 727 West 7th St., Los Angeles 14, Calif.; Victaulic Co. of Canada, Ltd., 200 Bay Street, Toronto.

PRELOAD
PRE-STRESSED
Concrete Construction

OF SURFACE TANKS, ELEVATED TANKS, STAND-PIPES, UNDERGROUND TANKS, RESERVOIRS, CONDUITS, PENSTOCKS, ETC.

ECONOMICAL - ENDURING
NO CORROSION - NO PAINTING

Entirely Built on the Site with Local Labor and Materials—Nationwide Service

Preload Dome, 155 foot diameter, covering 1,000,000 gallon reservoir.

Preload 4,200,000 gallon fuel tanks.

Preload 200,000 gallon elevated water tank 38 feet diameter, 146 feet high

Preload experience gained in hundreds of projects has made it possible to design with proper consideration of earth loads, foundations, shrinkage, temperature differences, plastic flow, working stresses, and all other factors which go into this type construction, to your most exacting requirements.

Write for list of Preload projects and illustrated bulletin "E."

THE PRELOAD CORP., 420 Lexington Ave., New York 17, N. Y.
BOSTON WASHINGTON MONTREAL

BIG JOBS AHEAD

for YOU...
with JACKSON VIBRATORY HAND SCREED!

But before you tackle the big Post-War concrete contracting jobs, get acquainted with the wide scope in concrete surfacing operations offered by the JACKSON SC-4A vibratory hand screed. Its advantages include lightweight, uniform vibration and adaptability to reasonable widths of section. Gives complete puddling to low-water content concrete. Write for further details.

ELECTRIC TAMPER & EQUIPMENT CO.
LUDINGTON MICHIGAN

Care of Truck Tires—With la size highway tires now being built synthetic rubber, the need for pr tire care and preventive maintena takes on added importance. This page book is designed to aid opera in obtaining maximum mileage either natural or synthetic rubber t —*Associated Tire Lines Division, B. F. Goodrich Co., Akron, Ohio.*

Difficult Foundations—A new il trated catalogue outlines this compa history and the scope of its work— structures and engineering construct The booklet also contains valuable d on the uses of underpinning and foundations for the guidance of e neers, architects and contractors.— *derpinning & Foundation Co., Inc., East 44th Street, New York, N. Y.*

Portable Electric Drill—This book is a colorful and interesting exposi of the growing use of plastics for m industrial purposes, especially as housing for a portable electric drill *Independent Pneumatic Tool Co., West Jackson Blv., Chicago 6, Ill.*

Cement Handling Equipment—D cribing bulk cement plans and cem handling equipment, a new bulle gives complete details and useful formation on this specially enginee equipment. Offering quick, conveni handling with a minimum of manpo and time, these cement chargers, h and silos are sized to fit any on-the-j requirements. Much of this equipm can be purchased in small units, th enlarged economically as needs expa —*C. S. Johnson Co., Champaign, Ill.*

Structural Specialties—Among t products covered in this catalog a Membranous cure for concrete, bitu inous curing compound, a bonding co for masonry walls, an asphaltic paint f cut stone backing, an asphalt for wa proofing foundations, a waterpro preservative for concrete, brick, sto etc., a hardener and accelerator for co crete, stucco and cement mortar, a many other structural specialties d rived from the application of chemis to industry—*The Johnson-March Cor 52 Vandervilt Ave., New York 17, N.*

STEEL SASH

practical, modern, beautiful, but... WILL IT RUST?"

Certainly steel is the practical, modern, economical material for sashes. Its great advantage lies in its permanency—an advantage it has only when properly protected against rust.

Hot Dip Galvanizing provides the perfect and inseparable fusion of the heaviest possible zinc coating to iron and steel products, and protects by sacrificial action. Laboratory and field tests both prove that this method is the best and more economical rust preventive.

If you want to be sure of the permanent beauty or usefulness of the iron or steel articles you buy, be sure to specify "Hot Dip Galvanizing." If you make articles of iron or steel, be sure of getting a genuine and expert job of Hot Dip Galvanizing by sending your materials to one of the members listed at the right. American Hot Dip Galvanizers Association, Inc., First National Bank Bldg., Pittsburgh 22, Pa.

"If it carries this seal it's a job well done."

Buy from the qualified members listed below and KNOW you are getting a genuine HOT-DIP job.

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EMSCO DERRICK & EQUIPMENT CO., LOS ANGELES
JOSLYN CO. OF CALIFORNIA, LOS ANGELES
WESTERN GALVANIZING COMPANY, LOS ANGELES
HUBBARD & CO., OAKLAND
JOHN FINN METAL WORKS, SAN FRANCISCO
SAN FRANCISCO GALVANIZING WORKS, SAN FRANCISCO
SUPERIOR PACIFIC GALVANIZING CO., LOS ANGELES
RHEEM MANUFACTURING CO., RICHMOND
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CONNECTICUT
WILCOX, CRITTENDEN & COMPANY, INC., MIDDLETOWN

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ILLINOIS
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MAINE
THE THOMAS LAUGHLIN CO., PORTLAND

MARYLAND
SOUTHERN GALVANIZING COMPANY, BALTIMORE

MICHIGAN
RIVERSIDE FOUNDRY & GALVANIZING CO., KALAMAZOO

MINNESOTA
LEWIS BOLT & NUT CO., MINNEAPOLIS

MISSOURI
COLUMBIAN STEEL TANK CO., KANSAS CITY
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DIAMOND EXPANSION BOLT CO., INC., GARWOOD
L. O. KOVEN & BROTHER, INC., JERSEY CITY
INDEPENDENT GALVANIZING COMPANY, NEWARK

NEW YORK
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THOMAS GREGORY GALVANIZING WORKS, MASPETH, (N. Y. C.)
ATLANTIC STAMPING CO., ROCHESTER

OHIO
THE WITT CORNICE COMPANY, CINCINNATI
THE FANNER MFG. CO., CLEVELAND
THE NATIONAL TELEPHONE SUPPLY CO., CLEVELAND
INTERNATIONAL-STACEY CORP., COLUMBUS
THE NEWARK GALVANIZING CO., NEWARK
COMMERCIAL METALS TREATING, INC., TOLEDO

OREGON
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PENN GALVANIZING CO., PHILADELPHIA
HANLON-GREGORY GALVANIZING CO., PITTSBURGH
OLIVER IRON & STEEL CORPORATION, PITTSBURGH

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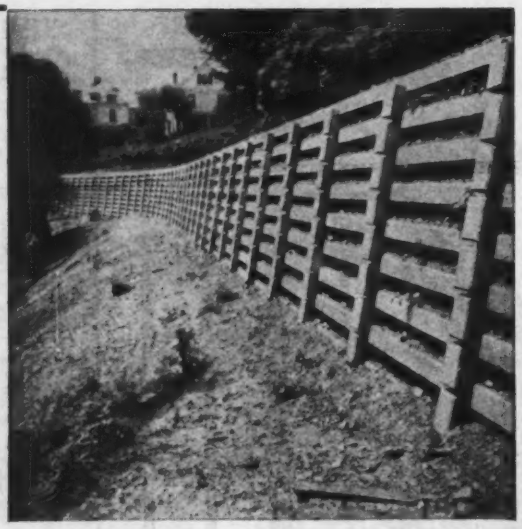
Not just Galvanizing but **hot-dip GALVANIZING**

Solve Problems With Universal Pre-Cast Concrete Cribbing



No forms, skilled labor or special equipment needed.

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A minimum of foundation excavation required.

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May be loaded as soon as completed—no curing time.

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May be moved from one location . . . and used in another.

Open-and-Closed-Face Cribbing Stocked in Our 26 Plants

Open face type is pictured. The closed face type has drainage provided, uses no filter blocks, presents pleasing appearance resembling cut ashlar. Write for complete data on cribbing.

We Also Stock Concrete Pipe in All Sizes from 6" to 120"

Larger sizes and pipe to meet special specifications made to order, promptly. Mobile plants can be established at project location; write for details.

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Home office, 297 South High Street, Columbus 15, Ohio

26 Plants in Eastern, Southern and Southwestern Locations

Eastern Sales Division, 1824 Graybar Bldg., N. Y. C.

Industrial Lubricating Equipm Described in this literature are centralized lubricating systems desi for application to small, medium large heavy duty machinery as we to large batteries of machinery w it is desirable to lubricate hundre bearings from a central point. of the systems provides bearings wi pre-determined amount of lubri under high pressure and signals operator when the job is complete *Alemite Division of Stewart-W Corp., 1826 Diversey Parkway, Chic Ill.*

Rust Prevention—A new solutio rust problems is outlined in this fo describing a product said to be valu in preparing spare parts, instrume engines, etc., for overseas shipment for Navy installation. It is a compo having atomic electro-magnetic pro ties in the presence of a metal.—*V line Oil Co., 5th and Butler Sts., cinnati, Ohio*

Rolling Doors — A 40-page cat tells the whole story of steel rol doors said to have these advantag Easy operation, space saving, durabi safety, neat appearance, economical stallation, and also fire, weather burglary protection.—*The Kinnear Co., 820-870 Fields Ave., Columbus*

Brass—Both wartime and peace uses of brass are fully illustrated described in this interesting broch put out by a concern established in 1 —*The Turner Brass Works, Sycam Ill.*

Sludge Collector—A sludge collec for round settling tanks is described a 24-page booklet. It also conta some valuable capacity tables for ci lar tanks, and other tables for we baffles, wheels, etc., and tells about ot sewage and water treatment pl equipment.—*Link Belt Co., 2045 Hunting Park Ave., Philadelphia,*

NO OTHER GRATING LIKE IT!

BLAW-KNOX ELECTROFORGED STEEL GRATING

Actually Blaw-Knox Grating is a one-piece, electroforged steel "material" which can be made to measure or cut to fit . . . Note these exclusive features:

1. Self-cleaning, no sharp corners to clog.
2. Maximum open area for light and air.
3. Easy to maintain . . . paint reaches entire surface.
4. Rigid electroforged construction means easy installation.
5. Twisted cross bar provides safe footing at all times.

Write for catalogue and sample.

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When they take the name off the door

E "new worlds" of peacetime To-rrow will mean plenty for *you* to . New airports, highways, houses, tories, and gigantic public works planned and just waiting for peace. Years of practical experience in han-ng the insurance needs for contract-... big and small, on all types of s... fit American Mutual to give u real help in getting these jobs done ht—and on time.

Every contract will present prob-ns, not the least of which will be urance: getting complete, fool-proof otection, effective accident-preven-n help, claim service and medical help when, where and how you need it. You will need help with this prob-lem. Get it from American Mutual.

Five American Mutual "extras" will give you practical help in handling your share of these jobs: (1) construc-tion-wise safety engineering experi-ence, (2) construction-wise claim and medical service, (3) lower insurance costs,* (4) trained insurance experts, and (5) the confidence inspired by American Mutual's name on any con-tract. *Free*—send for yours today—the "Five Extras" booklet describing them.

And *don't miss* American Mutual's other well-known booklet, "Foreman-ship and Accident Prevention in Con-struction," a real money saver. Send for your *free copy* today. American Mutual Liability Insurance Company, Dept. O-30, 142 Berkeley Street, Bos-ton 16, Massachusetts.

idends to policyholders have never been less n 20%.

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Your helping hand in building tomorrow's "new worlds"

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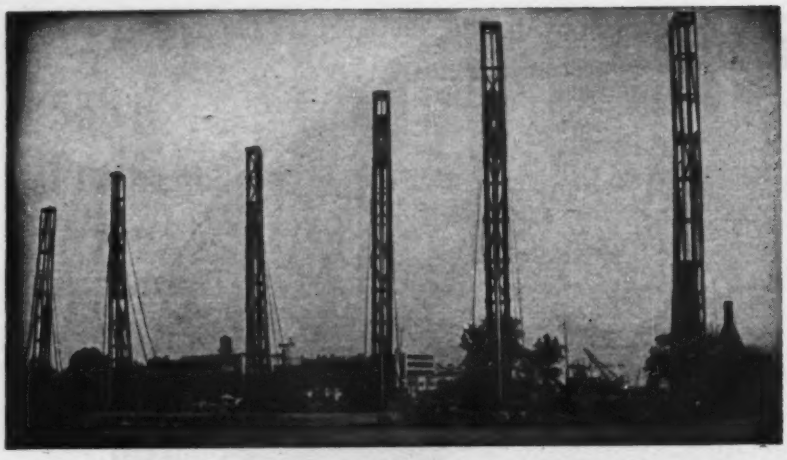

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WESTERN FOUNDATION CO.
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★★ Immediate delivery on Gasoline Powered 1½ H.P., and wheelbarrow or round base mounted 3 H.P. units on suitable priority.

BACK THE ATTACK BUY WAR BONDS

★ For their size, MALL Vibrators place more concrete per hour than any other vibrator.
★ They place a stiffer mix with important savings in cement, sand and labor.
★ MALL vibrated concrete assures a better bond with reinforcement . . . is free from honeycombs and voids . . . permits earlier stripping of forms . . . and makes a stronger, water-tight job.
★ MALL Vibrators are easily portable, use very little fuel, are easy to start, and require little attention.
★ MALL Vibrating elements are ruggedly constructed for long service with welded, special metal tips that withstand abrasive action.
★ Variable speed gasoline engine operates 8 other tools easily interchangeable with the vibrating element.

Write at once for full details.

MALL TOOL COMPANY
7730 SOUTH CHICAGO AVE. CHICAGO 19, ILL.

New Engineering Books

(*Continued from page 284*)

PROCEEDINGS—American Society for T ing Materials—Volume 43, 1943. 1 pp. Published by the society, 260 Broad St., Philadelphia 2, Pa.

AUTOMOTIVE NOMENCLATURE—English-C nese—By Calvin C. Chang. Marm Herrington Company, Inc., Indianap $2.50.

MATHEMATICAL AND PHYSICAL PRINCIP OF ENGINEERING ANALYSIS—By Wal C. Johnson. 346 pp. McGraw-Hill Bo Co., New York and London. $3.

FUNDAMENTALS OF INDETERMINATE STR TURES—Fred L. Plummer. 231 pp. P man Publishing Co., New York; Sir Isa Pitman & Sons, London.

DRIVER'S MANUAL—158 pp. The Wh Motor Co., Cleveland.

MOBILIZING FOR ABUNDANCE—By Robert Nathan. 228 pp. McGraw-Hill Bo Co., New York and London. $2.

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SPHEROGRAPHICAL NAVIGATION—By Dir Brouwer, F. Keator, and D. A. McMille The MacMillan Co., New York. $5.

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Reports and Pamphlets

FLOW OF WATER THROUGH SMALL SWING CHECK VALVES—By F. W. Greve. Re search Series No. 88, Engineering Ex periment Station, Purdue University Lafayette, Ind.

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LYNCHBURG, VA.—Annual Report, Fiscal Year ended December 31, 1943.

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ST. LOUIS, MISSOURI—27th Annual report of the City Plan Commission, 1942, 194

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TRAFFIC NEEDS AND THE POSTWAR HIGHWAY PROGRAM—By H. E. Hilts. Bulletin No. 83, American Road Builders' Association, Washington, D. C.

HIGHWAY TRANSPORTATION, Postwar needs—By W. Foster Banks. Postwar Planning Committee, Commerce and Industry Association of New York, New York, N. Y.

BITUMINIZED-FIBRE DRAIN AND SEWER PIPE—Commercial Standard CS116-44. Superintendent of Documents, Washington 25, D. C. 5c.

OHIO WATER TABLE SURVEY—By David H. Harker. Report to the Ohio Water Supply Board.

SURVEYOR'S IRRIGATION GUIDE—By Lee J. Noftzger. Technical Reports Service, Box 1895, Sacramento, Calif.

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NATIONAL SAND AND GRAVEL ASSOCIATION YEAR BOOK, 1944. Munsey Bldg., Washington, D. C.

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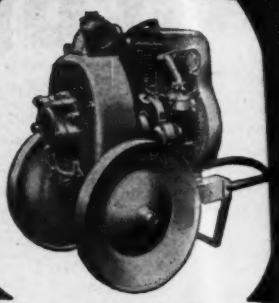

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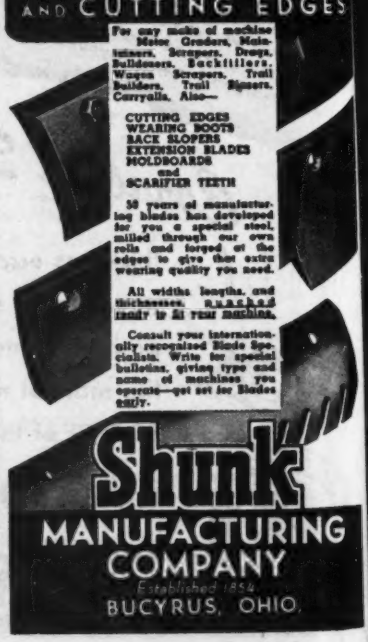
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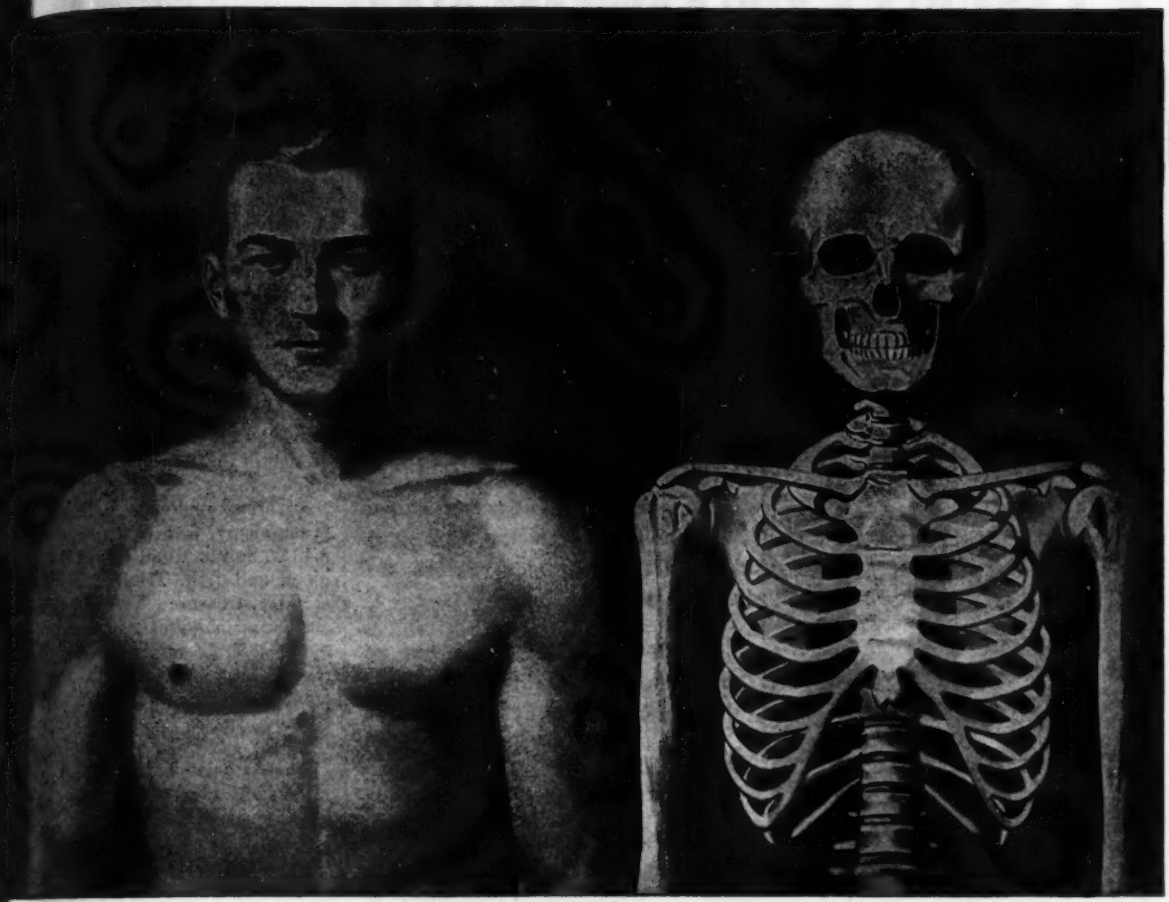

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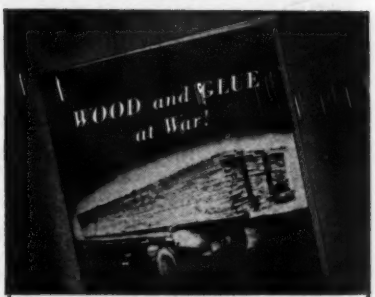
Keep this in mind: Plywood for the "skin," laminated wood for the "bones."

Have your engineers start now—to draw plans for the new wood buildings you will construct after the war. We shall be glad to help you work out the gluing methods.



HOW TO SPECIFY A GLUE

First, determine all hazards the product may encounter. Then, (1) Call in one of our Technical Service men, or (2) Write us for advice, describing your needs, or (3) Write for *"Wood and Glue at War"*, a general description of modern glues and their use—and the chart, *"Glue Recommendations for 57 U. S. Government Specifications"*, which details the durability of these glues in terms of standard tests.

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In 1940, an earth dam, known as Indian Rock Dam, was built in a gorge on Codorus Creek, near York, Pa., as part of a flood control project, the ends of the dam being the rocky sides of the gorge. The photograph shows how we sealed the rock with "GUNITE," 2" thick, before the earth was filled in.

"GUNITE" has hundreds of profitable uses in construction and rehabilitation. Our Bulletin 220 describes. Write for a copy.

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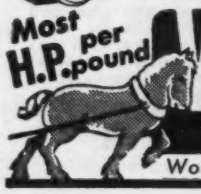

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Elections and Activities

Uel Stephens, city water superintendent of Ft. Worth, Tex., has been appointed chairman of a postwar and local improvements committee named by the Texas section of the American Society of Civil Engineers. Other members include W. O. Jones, Director of Public Works of Ft. Worth, and F. E. Lovett of the State highway department in the Tarrant Co. district office.

R. A. Smallman of Birmingham has been elected president of the Alabama section of the American Society of Civil Engineers.

Others elected were A. Reese Harwell, Montgomery, first vice president; Thurman A. Smith, Mobile, second vice president, and J. F. Tribble, Montgomery, secretary-treasurer. The following were elected members of the board of directors: T. M. Lowe, Auburn; S. J. Cummings, Tuscaloosa; R. B. Kulp, Fairfield; T. F. Hobart and H. A. Davis, Birmingham.

The Associated Contractors of South Dakota and the South Dakota Society of Engineers and Architects have elected officers for the year, as follows: George Douthit of Sioux Falls, president; Rose of Watertown, vice president; L. Boyce of Sioux Falls, secretary; and German Claus of Sioux Falls, treasurer.

E. D. Dake of Rapid City, S. D., has been elected president of the Society of Engineers and Architects. Mr. Dake succeeds R. E. Bragstad of Sioux Falls. Other officers are: Mr. Bragstad, vice president; H. M. Pierce, Huron, secretary-treasurer; and William H. Gamble of Brookings, W. F. Blatherwick of Sioux Falls; P. H. Schultz of Pierre and W. F. Cochrane of Omaha, Neb., council members.

The Carolinas Branch, Associated General Contractors of America, Inc., has elected C. P. Street of Charlotte, N. C., president. Mr. Street succeeds Collier Cobb, Jr., of Chapel Hill, N. C. Other officers elected: Ben Martin of Easley, S. C., vice-president; T. M. Sewell of Charlotte, N. C., treasurer; and Frank H. Conner of Charlotte, N. C., re-elected acting secretary.

O. H. Miller of Germantown, Tenn., president of the Choctaw Culvert and Machinery Co., Memphis, was elected president of the American Concrete Pipe Association, composed of concrete pipe manufacturers in the United States and Canada. Mr. Miller has been in business in Memphis 30 years.

The Story of 4,000 RUDDERS

Since the wartime shipbuilding program got under way Bethlehem's Fabricated Steel Construction Unit has been supplying parts and subassemblies to the nation's shipbuilders.

Take rudders, for example. During the last three years this organization has built about 4,000 ship rudders, more than any other single maker. And it has built them by means of bold new techniques which were evolved after it became necessary to abandon, successively, conventional forging and casting designs.

In 1941, Bethlehem began building 60 rudders for cargo ships for Britain. The same design, based on a patent by the Goldschmidt Corporation, was used for Liberty ships—of which some 2,100, all carrying Bethlehem-built rudders, had been produced by the end of 1943.

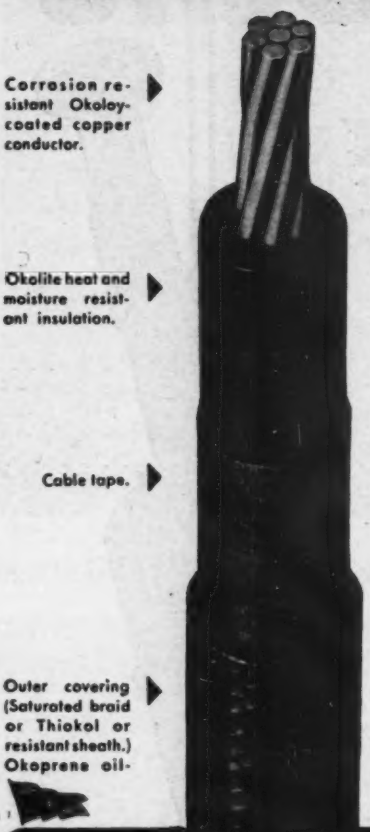
These 8-ton, 18-ft. rudders are of the "Contra-Guide" type, with two sections so shaped and related as to reduce rudder drag caused by propeller action, thus adding to the ship's speed. Lighter and cheaper to produce than the standard pre-war streamlined rudder, which involved forging operations, the Contra-Guide consists of a seamless steel tube, and horizontal ribs to which skin plating is secured. The rudder stock at the top, and the pintle at the bottom, are castings.

The whole rudder is built up by welding the plates, tubing, castings, etc., in special jigs and positioners which permit rapid production of identical, interchangeable units.

Bethlehem has built hundreds of rudders of other types, for naval as well as merchant vessels. But its second largest rudder job has been to produce a Contra-Guide rudder for tankers, which is built on extra-large steel frames that ordinarily would be cast. However, casting facilities being just as tight as those for forging, an all-welded rudder was evolved, constructed entirely of rolled steel. This became the basis for a rudder for the new Victory ship—and it is now being produced in quantity in Bethlehem shops.

★ ★ ★ BETHLEHEM STEEL ★ ★

WHY OKOLITE INSULATED CABLES ARE RECOMMENDED FOR CONSTRUCTION WIRING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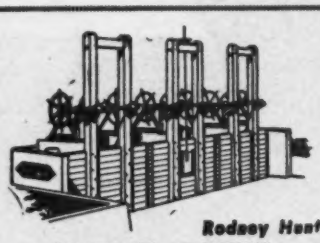

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New York 10, N. Y.

MEN AND JOBS

(*Continued from page 71*)

Maj. Millard Samuel Hayworth Asheboro, N. C., has been assigned the Symrna, Tenn., Army air field post engineer in charge of construc maintenance and repairs.

Lieut. Victor T. Arnim, assistant engineering officer at the Fort W Tex., Army air field, has been prom to captain. He was a Corpus Chr civil engineer.

Maj. Paul E. Werner has been pointed executive officer of the U district engineers office at Wilming N. C., succeeding T. J. Hewitt, civi employee, who is returning to the of chief of the engineering divi Until joining the Wilmington offic December, 1943, Major Hewitt was engineer at Camp Butner, N. C. charge of military construction th at the Raleigh-Durham airport, and Seymour Johnson Field at Goldsb N. C.

E. B. Gibbs, former resident engi for the North Carolina State High Commission at Durham, N. C., is with the Army Air Service Comman

C. F. Churchill is engineer for Federal Works Agency in connec with the construction of the Kings B water pumping station on the Cape F River for Wilmington, N. C.

G. A. Draper, former employe of Mississippi State Highway Departm has been promoted to lieutenant colo He has been with the Army Engine about two years.

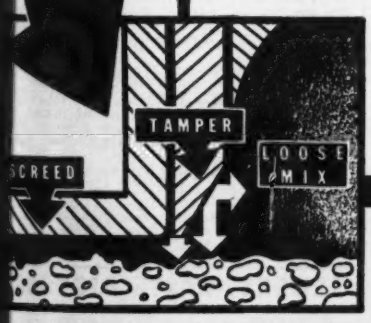
Henry D. Dewell, a well known str tural engineering authority, and for years a member of the California st board of registration for engineers, announced the association with him his son, Robert D. Dewell, under firm name of Dewell and Dewell, w offices at 604 Mission St., San Franci 5, Calif.

Robert H. Dodds has been promot to lieutenant in the Civil Engineer Cor of the Naval Reserve. A graduate Iowa State College, Lieutenant Dod left the editoral staff of the *Engineer News-Record* in 1940 to take gradu work at Northwestern University. Af work with the U. S. Engineers at Wrig Field, Dayton, Ohio, and with the co tractors building the Des Moines Or nance plant, he entered the naval serv as an ensign in January, 1942.

Asphalt Tampers

Joe was an early model asphalt tamper. Wearing his heavy wooden shoes, Joe got out on the hot, steaming mat and pounded down the spots around manholes and gratings that had to have tamping while the mix was hot. His boss used to wisecrack that Joe knew asphalt from the ground up. That's why he's running a Barber-Greene Finisher today—Joe knows the value of tamping while the mix is hot.

Joe is tamping 1200 strokes a minute now. Tamping the mix hotter than he could walk on it, even with his wooden clogs, while it is in the best workable condition. The roller that follows Joe and his B-G Finisher adds about an eighth inch final compaction. And the depressions are full of compacted material, not struck off material that will compress under traffic and repeat depression on new surface.



The bevelled face of the tamping bar does the actual compacting. It pushes the material forward as well as down, forcing the hot mix into the voids and produces a dense mat. The travel of the tamper imparts a rolling movement to the loose mix in the spreading chamber which prevents any segregation of material. The follow-up screed is level with the bottom stroke of the tamper bar and adds its weight to compacting the mat.

44-9

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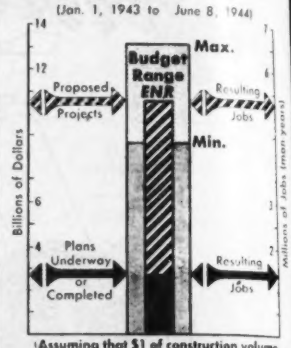
POSTWAR PROJECTS

POSTWAR CONSTRUCTION PROJECTS PROPOSED SHOWING VOLUME FOR WHICH PLANS ARE UNDER WAY OR COMPLETED

Status of postwar planning reported to ENR compared with annual postwar construction budget based on assumed National income of $150,000,000,000 per year

(Jan. 1, 1943 to June 8, 1944)



(Assuming that $1 of construction volume produces 1 man-hour of labor, ½ on site)

Projects proposed for postwar construction ha been published in these columns since Janua 1943, as they have been reported to Engineer News-Record.

The chart above shows, both in estimated do lar volume and in jobs or man-years of labo how fast this reservoir of future work is filling

If you or your community are working projects that have not yet been included in t "postwar reservoir," please send us an itemiz list and description of them, including estimat cost and the names of the engineers who p at work on the plans. Then as you watch th arrows climb you will know that you and yo community are contributing to the success of o NUMBER ONE JOB of preparing for peace

Address your projects list to Manager Bu ness News Department, Engineering New Record, 330 W. 42nd St., New York 18, N. Y.

MINIMUM SIZE OF PROJECTS PUBLISHED

Public Works	$25,0
Industrial Buildings	40,0
All Other Buildings	150,0

WATER SUPPLY

Minn., Luverne—City, E. Thron, su Utilities, installing water tower. Co $15,000. Ralph D. Thomas & Associa 1200 2 Ave. S., Minneapolis, consult. engrs.

Tenn., Dyersburg—City, plans comple iron removal plant, appurtenant wo $140,000. Black & Veatch, 4706 Bro Kansas City, Mo., consult. engr. CD 5/10 —ENR 5/13/43.

Vt., Rutland—City, City Hall, asked bo issue by Post War Planning Comn., addi storage reservoir adjacent to present co $80,000; 20 in. supply watermains, $95,0 at least 350 control valve addns. to sy $50,000. Funds available to start work plans.

Wis., Oshkosh—Bd. Water Comrs., filtra tion plant addn., watermains. $145,000.

Ont., Belleville—Municipality, rehabilita tion storage tank, duplication of mains, in stalling pressure gages, enlarging filte plant. $250,000. O. H. Scott, Pub. Util ties Comn., engr.

Ont., St. Catherines—Municipality, 4 m 24 in. main. A. L. McPhail, City Hall, engr

Ont., Sudbury—Municipality, replacemen of obsolete mains and enlargement existi mains, equip. and WW bldgs. impro $350,000. R. H. Martindale, City Hall, engr

SEWERS, WASTE DISPOSAL

Conn., Groton—Borough of Groton, A. E Card, 36 Forest St., sewage disposal plan $250,000.

★ **Mich., Benton Harbor and St. Joseph**—Cities of Benton Harbor and St. Joseph sewage treatment plant serving above mu nicipalities, $600,000. Consoer, Townsend Quinland, 211 W. Wacker Dr., Chicago, Ill. consult. engrs. CD 3/6—ENR 3/23.

Mich., Lansing—City, G. P. Mans, city engr., City Hall, sewage and garbage dis posal plant, $350,000. Shoecraft, Drury & McNamee, Ann Arbor, consult. engrs.

STWAR PROJECTS (Cont'd.)

N. J., **Summit**—City, City Hall, storm ...ter sewers, $150,000, sanitary sewers, ...,000. F. Murray, City Hall, engr.

Newfoundland, St. John's — Municipality, J. J. Mahony, city clk., City Hall, sewers, ...eets, water services for proposed homes, ...,000.

Ont., **Southampton**—Town, R. V. Ander-..., chn., sewage disposal plant and sys. ...out $125,000. Armstrong, Wood & Co., ...d. 62 Richmond St. W., Toronto, engrs.

BRIDGES

Minn., **Rochester**—City, F. R. Finch, clk., ...y Hall, about 300 ft. bridge from Mayo ...morial Park across Zumbro River to 2 ... and 2 Ave. S.E., $172,000. W. H. Wheeler, ...d Metropolitan Life Bldg., Minneapolis, ...grs. CD 5/24—ENR 6/1.

Missouri—State Hy. Comn., Jefferson City, ...ans 85% complete one 61 ft. and two 47 ... concrete block girder spans, concrete ...ers and bents on road from Mansfield to ...t. Grove, Route 60, Proj. PW FA 515 B1, ...right Co.; $30,000; plans 85% complete ...e 52 ft. and one 26 ft., concrete slab ...idges and one 98 ft. concrete slab girder, ...ad from Mt. Vernon to Springfield, Route ... Proj. PW FA 53(7), Lawrence Co.; ...,000; one 37 ft. bridge, concrete block ...rders, concrete bents over Cedar Creek, ...ad for Neosho south and north, Route ... Proj. PW FA 83 C1, Newton Co., $20,000; ...7 ft. bridge, concrete block girders, con-...rete piers and abutments, over Williams ...reek, road from Mt. Vernon to Springfield, ...oute 14, Proj. PW-FA 53 (6), Lawrence ..., $30,000, plans 90% completed on both ...rojects. C. W. Brown, ch. engr.

N. Y., **Ithaca**—City, plans 20% com-...leted, 7 concrete, steel arch and girder ...idges ranging from 100 to 324 ft. in ...ength, concrete fdns. $400,000. F. M. ...asters, State St. Bldg., Harrisburg, Pa., ...nsult. engr. CD 12/15—ENR 12/23.

Tex., **Waco**—City, A. N. Denton, mayor, ...w bridge across Brazos River. Over ...00,000.

B. C., **Vancouver**—Dominion Govt., Ottawa, ...nt., bridge over Fraser River. $150,000 or ...ore. Dpt. P. Wks., Ottawa, Ont., engrs. ...D 11/15—ENR 11/18.

STREETS AND ROADS

★ **New York**—President Richmond Boro, ★ Boro Hall, St. George, Willowbrook Park-...ay, $4,029,500. L. C. Combs, 681 5 Ave., ...ew York, landscape archt. CD 2/21—ENR ...9.

★ **Ore., Portland**—City, City Hall, plans ★ 80% completed roads, bridges, $4,000,000. ...W. Buck, City Hall, engr.

★ **Texas**—Pub. Roads Admin., 18 and F ★ Sts. N.W., Wash., 25, D. C., and Texas ...tate Hy. Dpt., Austin, constructing Na-...ional Interregional Hy. Sys., through Dal-...as, Dallas Co., consisting two 3-lane sep-...rate trafficways, etc. $11,700,000. J. Bar-...holomew, City Hall, Dallas, master planner, ...nd D. C. Greer, State Hy. Offices, Green-...ille Ave., Austin, engr. CD 1/31—ENR ...2/10.

Vt., Rutland—City, City Hall, asked bond ...ssue by Post War Planning Comn., con-...tructing various streets and repairing ...thers. $150,000. Funds available to start ...work on plans.

★ **B. C., Langley**—Municipality of Langley, ★ Murrayville, hard-surfacing 83 mi. ...ravel roads, also preliminary work incl. ...work on culverts, ditches and straightening, ...$500,000.

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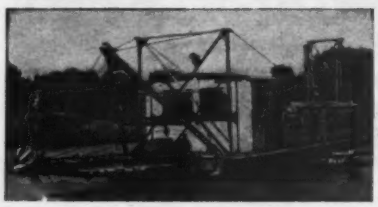

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COLORADO

Missouri River Basin
Niobrara-Platte-Kansas Sub-basin.

Irrigation at Narrows $5,000,000, Narrows Reservoir $10,000,000, Morgan Co., **Platte River Basin.**

Constructing Wray Reservoir, north fork of Republican River, $764,900, irrigation North Republican unit $160,500, Yuma Co. irrigation at Meeker, Rio Blanc Co., $389,700. **Kansas River Basin.**

Reservoir and power plant Cherry Creek, $6,200,000.

KANSAS

Missouri River Basin
Niobrara-Platte-Kansas Sub-basin.

Irrigation at St. Francis, Cheyenne Co. $792,600*** at Almena, $420,800, constructing Norton Reservoir, Prairie Dog Creek $5,781,300, Norton Co.***irrigation at Republic $781,900, at Scandia $836,500, both Republic Co.***irrigation at Kirwin $1,000,000. Kirwin Reservoir north fork Solomon River, $9,000,000, Smith Co.***Webster Reservoir south fork Solomon River $7,100,000, irrigation at Webster $700,000 Osborne Co.*** irrigation Glen Elder, $1,810,000, Glen Elder Reservoir, $15,500,000, Mitchell Co.***irrigation Wilson, $1,110,000, Wilson Reservoir, Saline River, $6,000,000, Lincoln Co.***irrigation Cedar Bluffs, $1,110,000 Cedar Bluff Reservoir, Smoky Hill River $6,500,000, Ellis Co.***irrigation Kanopolis $2,390,000, Kanopolis Reservoir, Smoky Hill River, $9,000,000, Saline Co., all foregoing in **Kansas River Basin.**

Reservoir and power plant at Kanopolis, $9,000,000, Ellsworth Co.*** Pioneer Reservoir, on Arikaree River, $6,914,000. Bonny Reservoir and power plant, South fork Republican River, $12,519,000.

Lower Missouri Sub-Basin

Tuttle Creek Reservoir, $28,000,000. (To be constructed by U. S. Engineers).

MISSOURI

Lower Missouri Sub-basin.

Flood control reservoirs Osceola, $28,500,000***Pomme de Terra $6,200,000***South Grand $10,400,000***Chillicothe $28,500,000 ***Arlington $7,300,000***Richland $6,900,000 ***Levee sys. $80,000,000. (To be constructed by U. S. Engineers).

MONTANA

Missouri River Basin
Lower Missouri Subdivision.

Medicine Lake Reservoir, Big Muddy Creek, Northern Div., $7,700,000.

Upper Missouri River Basin

Irrigation, Red Rock unit, $122,000; irrigation Horse Prairie unit, $44,440; Brenner Reservoir, Horse Prairie Creek, $1,101,560; irrigation, Dillon Valley unit, $2,142,300; Clark Canyon Reservoir, Beaverhead River, $5,834,000; Landon Reservoir, Blacktail Creek, $1,022,500; Kelley Reservoir, Rattlesnake Creek, $396,200; Apex Reservoir, Birch Creek, $338,000, all foregoing in Beaverhead Co.***irrigation, Ruby unit, $566,000*** Apex Reservoir, Birch Creek, $174,000, Madison Co.***irrigation, Jefferson unit, $3,285,000; Whitetail Reservoir, Whitetail Creek, $58,000, irrigation, Terry Reservoir $529,000, all foregoing Jefferson Co.***Irrigation, Three Forks unit, $32,924,250, Taylor Reservoir, Taylor fork of Galatin River, $1,285,000, Bridger Reservoir, Bridger Creek, $1,118,750; irrigation, drainage, Clarkston Pumping unit, $153,000 all foregoing in Gallatin Co.***Broadwater-Missouri Unit, $403,000, Broadwater Co.*** Helena Valley Pumping Unit, $1,896,000; irrigation, drainage, Rock Creek and Wells Reservoir, $287,000; irrigation, drainage and constructing Nilan Reservoir (off stream) $414,000, all foregoing in Lewis and Clark Co.***irrigation, drainage, Chestnut Valley Ext., Cascade Co. $300,000; Uim Valley Pumping unit, $306,000; Great Falls Pumping unit, $1,168,000, all foregoing Cascade Co.*** irrigation, drainage, Newland, $184,000; Newland Reservoir in Newland Creek, $840,000, Meagher Co.***irrigation, drainage, Sun River Project ext. $1,074,000;***irrigation, drainage, Stanford, $60,000. Stanford Reservoir in Skull Creek, $240,000; irrigation, drainage, Hobson, $35,000, Hobson Reservoir in Judith River, $760,000, all foregoing Judith Basin Co.***irrigation, Ross Fork, $105,000; Ross Fork Reservoir, $480,000; irrigation, drainage, constructing Snowy Reservoir in Cottonwood Creek, at Hanover, $500,000; irrigation, drainage, at Lewiston, $300,000, all foregoing in Fergus Co.***irrigation, drainage, Lower Marias, $12,892,000; Tiber Reservoir on Marias River, $6,808,000, Hill and Chouteau Counties***irrigation, drainage, Saco Divide (pump) unit, $680,000 ***irrigation, drainage, Teton Slope, $1,879,000; Wilson Reservoir in north fork Sun

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WAR PROJECTS (Cont'd.)

$2,530,000, Teton and Chouteau ***irrigation, drainage, Dodson ng unit, $62,000*** Fort Belknap e unit, $101,000***Fort Shaw drain- nit, $13,000***Greenfields Lake drain- nit, $35,000***reservoir and power Canyon Ferry, Missouri River, $11,025,- reservoir and power plant, Lyons. ***reservoir and power plant at , $1,600,000, all foregoing on Missouri above the mouth of the Milk River.

UPPER MISSOURI RIVER BASIN
Minor Western Tributaries.

gation at Little Missouri unit, $540,000, ructing Alzada Reservoir in Little uri River, $1,900,000, Carter Co.

YELLOWSTONE BASIN PROJECT

gation, Greycliff, Sweet Grass Co., ***Cove Canal Ext. $232,000; Huntley $214,000; Seven Mile Flat, $867,000, wstone Co.***North Custer $390,000; am $891,000; Antelope Flat $1,522,000; Sanders $21,000, all foregoing Treas- Co.***Mission Ditch, Park Co. $89,000 inoco $97,000; Chimney Rock $346,000; land Park $1,190,000; Hathaway $157,- all foregoing in Rosebud Co.*** Fort ; Custer Co. $187,000 *** Saugus- 00 $228,000; Buffalo Rapids (3rd Div.) ,000, both Prairie Co.***Cracker Box ; Colgate $183,000; Stipek $714,000; , $44,000, all foregoing Dawson Co.*** e $189,000, Elm Coulee, $185,000; Seven s $154,000; Sidney Ext. $199,000; all ing Richland Co.***Cartwright $32,- Billings drainage $1,128,000; Custer ake $706,000, all foregoing in Yellow- River, (main stem).

igation at Hardin, $3,725,000; Little $1,403,000; Custer Bench $1,729,000; , $550,000; Benteen Flat $245,000; efield $206,000; Crow $203,000, all oing in Big Horn Co. for Big Horn Basin.

igation, Whitehorse Bench, Carbon Co. 00 for Clarks Fork Basin.

structing South Fork Reservoir, south Tongue River, $1,600,000, irrigation at dan Canal, $1,583,000, both Sheridan *constructing Mission Reservoir in Yel- one River, Park Co. $12,278,000*** lope Reservoir on Shields River, $607,- *Sweetgrass Reservoir, Sweetgrass , Sweetgrass Co. $383,000***Yellowtail rvoir, Big Horn River, $30,289,000, for wstone River Basin.

NEBRASKA
Niobrara-Platte-Kansas Sub-basin.

igation Sargent, Custer Co. (no cost)*** ell and Lower North Loup, both How- Co. (no cost)***constructing Plum Creek rvoir, Cedar Rapids, in Greeley, Boone Nance Counties, $8,700,000***Boelus rvoir, south fork of Loup River, Albion, e Co., $20,000,000***Irrigation, Loup , $44,800,000; Dismal Reservoir, Dis- River, $4,000,000, Platte Co.***Davis rvoir, north fork Loup River at Plum . Kearny and Buffalo Counties, 00,000***Erickson Reservoir, Cedar , at Grand Island, Hall Co., $2,500,000 oretto Reservoir, Beaver Creek, at le Creek, Merrick Co., $2,000,000***irri- n to benefit 120,000 acres Osceola, Co. (no cost)***80,000 acres in Bell- , Butler Co. (no cost)***120,000 acres huyler, Dodge Co. (no cost), all fore- in Platte River Basin.

igation Wells, Hitchcock Co., $1,140,300 rigation Frenchman, $656,000; Harvey rvoir, $3,632,000***irrigation Red Wil- $1,200,100, all foregoing in Red Willow *irrigation Cambridge, Furness Co., 9,500***Oxford, Harlan Co., $428,800*** klin, Franklin Co., $692,000***Red , $611,000; Superior-Courtland, $4,- 00, both Webster Co., all foregoing in as River Basin.

eservoirs and power plant at Medicine k, Frontier Co., $2,522,600***Culbertson, hcock Co., $16,398,300***Harlan County rvoir, $22,311,500.

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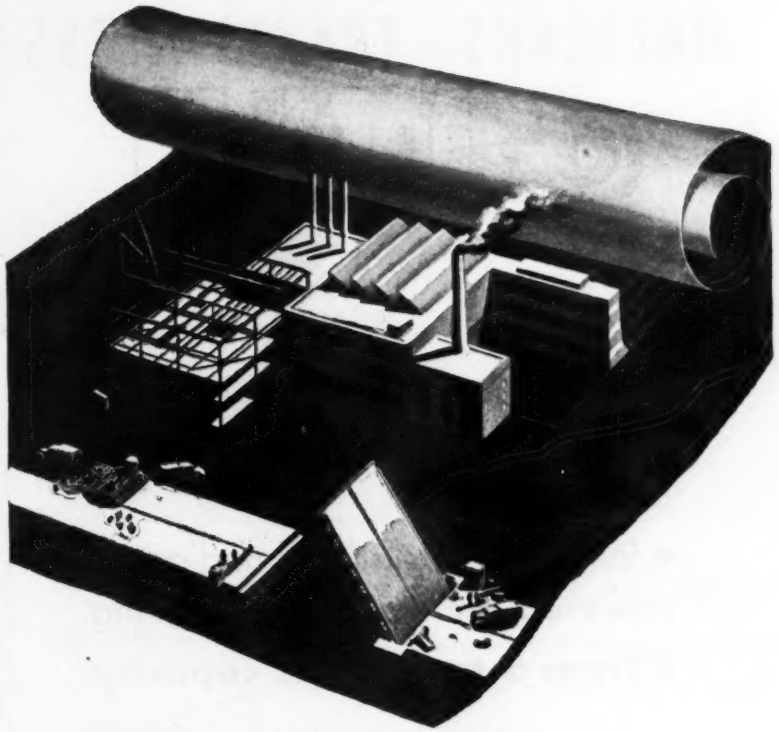

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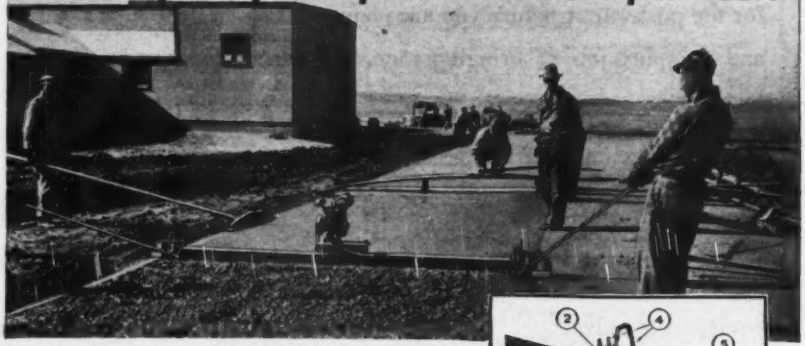

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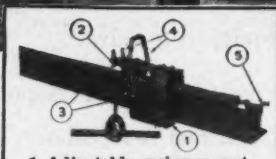

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NORTH DAKOTA

Missouri River Basin
Minor Western Tributaries.

Irrigation Knife River, $740,000, ...ing; Bironcho Reservoir on Knife ..., $2,600,000, both Mercer Co.***irrig... Heart River, $955,670, Dickinson Res... $311,300, and Heart Butte Reservoir, Heart River, $1,585,000, Morton, Stark Grant Counties***Irrigation Cannonball ... $1,277,500, Cannonball Reservoir, Canno... River, $500,000, Thunderhawk Reservoir, Cedar River, $700,000, Grant and ... Counties.

Missouri River Basin.
Lower Missouri Subdivision.

Irrigation Missouri-Souris Glasgow ... $4,886,000***Crosby Reservoir, Northern ... $2,720,000***Irrigation North Dakota ... ing unit, $6,081,000***New Rockford ... $3,519,000***Jamestown unit, $2,... Jamestown Reservoir, in James ... $4,825,000***municipal, recreation and ... gation project on Sheyenne Reservoir, Sheyenne River (no price), all foregoing ... Fort Peck-Sioux City Sub-basin.

Missouri River Pumping unit, $4,...

Proposed Irrigation projects to use ... pumped from Missouri River.

Irrigation 4,500 acres Shell Creek ... 4,130 acres Independence unit; 9,400 ... Fort Berthold unit; 6,510 acres Old Ag... Flats unit; 2,700 acres Old Agency ... (No. 2) unit; 6,830 acres Fort Steve... unit; 1,500 acres Mannhaven unit; 5,030 ... Hancock Flats unit; 2,750 acres Fort ... unit; 6,880 acres Oliver-Sanger unit; ... acres Painted Woods unit; 2,160 acres ... ley unit; 2,400 acres Wogansport unit; ... acres Square Butte unit; 1,940 acres ... Creek unit; 3,930 acres Little Heart ... 9,000 acres Horsehead Flats unit; 5,100 ... Winona unit; 4,880 acres Bismarck un...

SOUTH DAKOTA

Missouri River Basin
Minor Western Tributaries.

Irrigation, Grand River unit, $1,51... constructing Shadehill Reservoir, $1,02... Blue Horse Reservoir, $750,000, both ... Grand River, Corson and Perkins Counties; ... irrigation, Moreau River unit, $2,01... Bixby Reservoir, $1,100,000, Green ... Reservoir, $1,525,000, both in Moreau ... Perkins, Ziebach and Dewey Counties*** ...rigation, Cheyenne unit, $3,226,200, ... tura Reservoir in Cheyenne River, $3,0... Pennington, Haakon, Meade and Fall ... Counties***irrigation, Edgemont unit, $... 000***irrigation, Bad River unit, $39... North Fork Reservoir in North Fork ... River, $800,000, Haakon and Stanley ... ties***irrigation, White River unit, $2,01... Rockyford Reservoir, in White ... $3,525,000, Jackson, Jones, Lyman and ... ington Counties.

Missouri River Basin
Lower Missouri Subdivision.

Irrigation, South Dakota Pumping ... $3,644,000***Oakes unit, Brown ... $2,043,000; Oahe unit (James River), ... 500,000; reservoir, power plant at Oahe ... souri River, Potter and Stanley Coun... $72,800,000***reservoir and power plant ... Bend, in Missouri River, Lyman ... $26,000,000***reservoir and power ... Fort Randall in Missouri River, Brule ... Chas. Mix Counties, $55,700,000, all for... ing in **Fort Peck-Sioux City Sub-basin.**

Proposed irrigation projects to use ... pumped from Missouri River.

Irrigation, 570 acres in Chantier ... 1,850 acres Oahe unit; 1,050 acres La For... oise unit; 900 acres Pierre unit; 3,310 ... Rousseau unit; 2,720 acres LaRoche ... 6,560 acres Joe Creek unit; 1,850 acres ... Red Cloud unit; 5,680 acres Culdesac ... 8,520 acres Big Bend unit; 7,710 acres ... Thompson unit; 2,100 acres in Fort ... unit; 650 acres Grosse unit; 900 acres ... Randall unit; 3,130 acres Tower unit; ... acres Greenwood unit; 1,640 acres Run... Water unit; 2,390 acres Yankton unit.

WYOMING

Missouri Basin Project
Niobara-Platte-Kansas Sub-basin.

Constructing Glendo Reservoir and ... plant on North Platte River, $4,000,... reservoir and power plant at ... $5,545,000.

Missouri River Basin
Minor Western Tributaries.

Edgemont Reservoir, Beaver Creek, ... Co., $1,195,000***Keyhole Reservoir, ... Fourche River, Crook Co., $750,000.

Yellowstone Basin.

Irrigation, Fremont unit, $5,123,000; ... Noir Reservoir, Wind River, $2,700,000; ... gation, Owl Creek unit, $442,000, ... Reservoir, Owl Creek, $696,000, all forego... in Hot Springs Co.***irrigation, Little ... River unit, and constructing Raft ... Reservoir in Little Wind River, $52... irrigation, Popo Agie River unit, $16... Soral Creek Reservoir, on Popo Agie Ri... $1,336,000; irrigation, Hudson Bench ...

TWAR PROJECTS (Cont'd.)

...; Onion Flat Reservoir in tributary ... Wind River, $582,000; irrigation, ...shone unit, $1,192,000; irrigation, Red... unit, $82,000, Badwater Reservoir, ...ary Badwater Creek, $536,000; irriga... Shoshone Project Ext., $8,060,000, ...on Basin Reservoir, on Shoshone River, ...,000, all foregoing in Fremont Co.*** ...ation, Paintrock unit, $262,000, Lake ...fe Reservoir in Paintrock Creek, ...,000, irrigation, Shell Creek, $198,000, ... Gulch Reservoir on Shell Creek, $1,- ...; irrigation, Big Horn Pumping unit, ...,000, all foregoing in Big Horn Co., ...foregoing for **Big Horn River Basin.**

...rigation, **Tongue River** Pumping unit, ...,000: **Tongue River Basin.**

...rigation, Piney Unit, $83,000, Willow Park ...rvoir, south fork Piney Creek, $764,000; ...ation, Buffalo unit, $461,000; Bull Creek ...rvoir, in Clear Creek, $2,720,000; Irriga... French Creek unit, $42,000; Triangle ... Reservoir, in south fork Rock Creek, ...,000; irrigation, Uncross unit, $548,000; ... Deemet Reservoir in Pine Creek, ...,000, irrigation, Arvada unit, $1,602,000, ...foregoing in Sheridan Co.***irrigation, ...rehead unit, $4,055,000, Moorehead Reser... in Powder River, $4,000,000, Campbell ...irrigation, Crazy Woman unit, $1.- ...,000; Smith Reservoir in north fork ...der River, $1,677,000; irrigation, Kaycee ... $1,227,000, Middle Fork Reservoir, ...der River, $2,011,000, Johnson Co., all ...going in **Powder River Basin.**

...eservoirs and power plants, Hunter ...ntain, $8,300,000; Thief Creek, $14,- ...,000, Sunlight, $3,433,000; Baldridge, ...19,000, all foregoing in **Shoshone National ...est.**

...eservoirs and power plants, Boysen, Fre... ...t Co., $8,202,000***Kane, Big Horn Co., ...,000***Tongue River, Sheridan Co., ...73,000.

Power Systems.

...rt Peck Power System, $10,963,000. ...ower transmission grid, $68,000,000.

...S. ENGINEERS, WAR DEPARTMENT ...21 St. and Virginia Ave. N.W., ... Wash., 25, D. C., ...submitted report to Committee on ...Flood Control House of Representatives.

MISSOURI RIVER BASIN
Projects Authorized

$29,000,000 have been authorized for following projects:

...olorado — Constructing Cherry Creek ...rvoir, $8,200,000, total Cherry Creek ...ject $11,000,000. Noted CD 4/21—ENR

...ansas — Kanopolis Reservoir (partially ...tructed), $3,000,000 to complete***Tut- ... Creek Reservoir, $28,000,000.

...ansas and Missouri—Flood control at ...sas City, Kan. and Kansas City, Mo. ...,000,000 ($13,000,000 federal, $2,200,000 ...-federal). Noted CD 4/21—ENR 5/4.

...ansas and Nebraska—Harlan County ...rvoir, incl. storage for irrigation, ...,000,000.

...issouri — Osceola Reservoir, $28,500,000 ...Chillicothe Reservoir, $28,500,000***Ar... ...on Reservoir $7,300,000***South Grand ...ervoir $10,400,000***Pomme de Terre ...ervoir $6,200,000***Richland Reservoir ...00,000.

Projects not Authorized

...olorado — Beecher Island Reservoir, ...00,000***Hale Reservoir, $7,200,000.

...wa—Levees in Missouri River at Sioux ... $630,000***Council Bluffs $1,600,000.

...wa and Nebraska—Levees in Missouri ...er from Sioux City, Ia. to Platte River ...500,000.

...issouri—Levees in Missouri River from ...sas City to Jefferson City, $22,500,000 ...rom Jefferson City to mouth $14,000,000.

...ontana—Lower Canyon Reservoir $35,- ...000.

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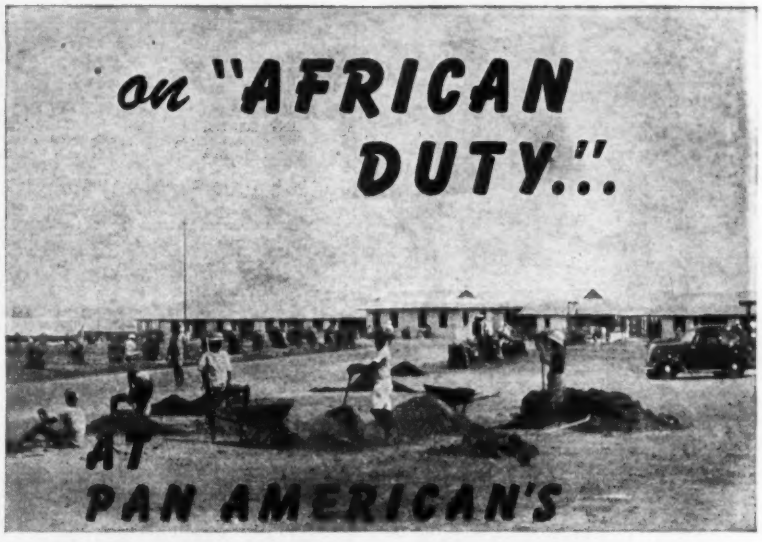

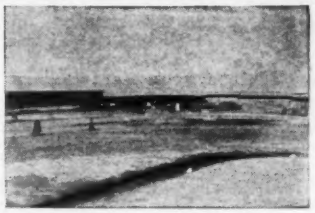

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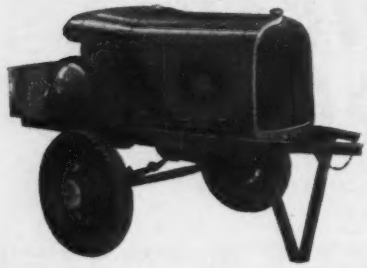

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POSTWAR PROJECTS (Cont'd.)

Nebraska—Red Willow Reservoir $2,100,000***Enders Reservoir, $6,700,000***Medicine Creek Reservoir $2,400,000**levees in Missouri River from Platte River to Rulo, $8,000,000***at Omaha, $3,800,000.

Nebraska and Missouri—Levees in Missouri River from Rulo, Neb. to Kansas City, Mo., $15,000,000.

North Dakota—Garrison Reservoir, $130,000,000***Oak Creek Reservoir $60,000,000.

South Dakota—Oahe Reservoir $50,000,000***Fort Randall Reservoir $75,000,000.

South Dakota and Nebraska — Gavins Point Reservoir $15,000,000.

Wyoming—Boysen Reservoir, $20,000,000.

†**Kansas**—U. S. Eng., 21 St. and Virginia Ave. N.W., Wash., 25, D. C., levees at Lawrence, $165,100; remaining work on levee and flood wall, at Topeka, $316,000, both in Missouri River Basin.

†**Montana**—U. S. Eng., 21 St. and Virginia Ave. N.W., Wash., 25, D. C., levees at Forsythe, $97,000; at Wilbaux, $42,300; at Saco, $26,000, all in Missouri River Basin.

N. J., Summit—City, City Hall, retaining walls along brooks for flood control, $75,000. F. Murray, City Hall, engr.

†**North Dakota**—U. S. Eng., 21 St. and Virginia Ave. N.W., Wash. 25, D. C., levees at Marmarth, in Missouri River Basin, $18,970.

†**Nebraska**—U. S. Eng., 21 St. and Virginia Ave. N.W., Wash. 25, D. C., bank imprvs., at Schuyler, in Missouri River Basin, $63,000.

★**Ore., Portland**—City, City Hall, plans 10% completed harbor imprvs., constructing new facilities, $3,000,000. A. D. Merrill, c/o Comn. Pub. Docks, City Hall, engr.

★†**Pennsylvania**—U. S. Eng., 21 St. and Virginia Ave. N.W., Wash. 25, D. C., anchorage area at Mantua Creek and Marcus Hook, first dredging, etc., $3,380,000.

★†**South Dakota**—U S. Eng., 21 St. and Virginia Ave. N.W., Wash. 25, D. C., 2 reservoirs at Fall River and channel imprvs. at Hot Springs, in Missouri River Basin, $800,000.

Tex., Waco—City, A. N. Denton, mayor, City Hall, flood control of Brazos River. Over $100,000.

B. C., White Rock—Dominion Govt., Ottawa, Ont., breakwater. $50,000. Dpt. P. Wks., Ottawa, Ont., engr.

UNCLASSIFIED

★**Illinois** — PARK IMPROVEMENTS—State Div. Parks & Monuments, Armory Bldg., Springfield, imprv. Cahokia Mounds State Park, incl. black top roads and surfacing, St. Clair and Madison Counties, $25,000; Fort Kaskaskia State Park, black top roads and surfacing, Randolph Co., $30,000; Giant City State Park, baths for cabins, $36,000, 4-room native stone, timber cabins, $25,000, help quarters, $25,000, exten. water sys., $20,000, artificial lake, $100,000, Jackson and Union Counties; Siloam Springs, black top roads, $40,000; complete water sys., $20,000, 4-room cabins, $50,000, artificial lake, $100,000, Brown and Adams Counties; Salem States Park, room addn. on custodian's house, $50,000, historical restoration, $50,000, archeological work, $25,000, Menard Co.; Pere Marquette State Park, room addn., $200,000, 1-room cabins behind present lodge, $50,000, 4-room cabins behind present lodge, $30,000, help quarters, $45,000, Jersey Co.; White Pines Forest State Park, 7 baths for cabins $30,000, 4-room log, stone cabins, $25,000, help quarters, $25,000, Ogle Co.; Fort Chartres State Park, historical restoration, determining outline of Fort, $250,000, and archeological work, $25,000, Randolph Co.; Fort Massac State Park, historical restoration, Massac Co., $100,000; Lincoln Trail Homestead, historical restoration determining exact location of first Lincoln home, about 8 mi. west of Decatur on Sangamon River, Macon Co., $25,000; Lincoln Tomb, monument repairs, Sangamon Co., $50,000; Kickapoo State Park, roads, $30,000, picnic area, $25,000, lodge, $50,000, Vermilion Co.; Mississippi Palisades, roads, $40,000, 1-room cabins, $50,000, 4-room cabins, $50,000, lodge, $300,000, Carroll Co.; sketches Illinois Beach, bath houses, $400,000, complete water sys., $50,000, complete sewage sys., $50,000, electric sys., $25,000, black top roads, $40,000, help quarters, $25,000, concession stand, $25,000, Lake Co.; plans completed Starved Rock State Park, exten. water sys., $100,000, log, native stone lodge, $50,000; 48-room addn. to present lodge, $200,000, 4-room cabins, $25,000; help quarters, $25,000, La-Salle Co.

Ia., Storm Lake—AIRPORT—City, approved bond issue, airport, $65,300.

Mich., Detroit—POWER and LIGHTING TRANSMISSION LINES—Pub. Lighting Comn., L. J. Schrenk, supt., E. Atwater St., power and lighting transmission lines known as Blue Hill Service and loop tie from Philip to Conner Ave. $300,000. CD 3/30/43 —ENR 4/8/43.

Mont., Great Falls—GRAND STAND—North Montana State Fair Assn., Great Falls, grandstand at fairgrounds, $200,000. Corwin & Co., Ford Bldg., Great Falls, consult. engrs.

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AR PROJECTS (Cont'd.)

York—BATHING BEACH, etc.—Parks, Arsenal Bldg., Central Park, and Fifth Ave., New York, Zone 21, derway bathing beach, bath house neral development adjacent areas at w Park, Queens Co., **$4,100,000.** ers, Owings & Merrill, 6 E. 57 St., York, archt. J. Ray, 101 Park Ave., York, Zone 17, landscape archt. CD ENR 2/10.

Y., Allegany—AIRPORT—Allegany ley Aviation Comn. c/o T. A. Gustaf- City Hall, Olean, municipal airport, ,500 and 2,500 ft. hard-surfaced run- **$1,000,000.** C. Paul Clark, Olean,

Y., Elmira—WALL, etc.—Dpt. P. Wks., Office Bldg., Albany, plans completed No. Cor-43 new south wall and in- ion electrically operated gate at El- Reformatory for Correction Dpt., State Bldg., Albany, **$160,000.** Div. Con- ion, Div. Architecture, C. J. White, State Office Bldg., Albany, engr. CD -ENR 1/13.

Y., Napanoch—WALLS—Dpt. P. Wks., Office Bldg., Albany, preliminary plans way Proj. No. Cor-4, repairing prison etween cell block and guard towers uthwest corners prison wall and re- south and east prison walls, incl. towers and service connections at ate for Male Defective Delinquents, for Correction, State Office Bldg., Albany, 00. Div. Construction, Div. Architec- C. J. White, comr., State Office Bldg., CD 9/15—ENR 9/23.

N., New York—BEACH FACILITIES—Parks, Arsenal Bldg., Central Park, and 5 Ave., plans underway altering g facilities, utilities at Orchard Pelham Bay Park, **$130,000.** E. A. 11 E. 37 St., New York, engr. CD —ENR 2/4/43.

Cleveland—PARK IMPROVEMENTS City, R. Munson, dir. Pub. Properties, Hall, miscellaneous imprvs. to City and Kingsbury Run Development, 00; Forest Hills Park Development, 0; Brookside Park completion project, imal bldg., general imprvs., **$1,083,650.** regelius, 517 City Hall, city archt. wman, City Hall, park engr.

Cleveland—PLAYGROUNDS—City, A. unson, dir. Pub. Properties, City Hall, rounds in 32 wards, **$4,307,066.** H. lius, 517 City Hall, city archt. S. an, City Hall, city park engr. CD —ENR 12/16.

x., Dallas—AIRPORT—City, Red Bird ne Airport, in Oak Cliff, incl. grading, ge, paving runways, etc., **$1,080,000** , roads, lighting, etc., **$500,000,** Runway 100% complete. H. Bartholomew, City and Rollins & Forrest, Praetorian Bldg.,

x., San Antonio—PARK IMPROVE- ENTS, etc. — City, G. Mauermann, r. City Hall, general park beautifica- incl. erosion control, excav., tree plant- etc., **$100,000;** park recreation bldg., **$40,000;** greenhouse, **$50,000;** Sunken n imprvs., incl. ground development, walls, walks, etc., **$25,000;** under- d sprinkler sys., **$75,000;** park electric e lighting incl. roads, paths, etc., 0; rehabilitating 5 rein.-con. swimming **$225,000;** playgrounds, camping facili- $30,000.

ash., Seattle—AIRPORT BLDG.—Port Seattle Comn., Bell St. Terminal, ad- tration bldg., at Bow Lake Airport, of here, **$1,500,000.**

PUBLIC BUILDINGS

n., Norwich—City Bd. Educ., Norwich, by Carl J. Malmfeldt & Associates, 36 St., Hartford, 1 and 2 story, brick school, Platt Ave., Warren and Rock- Sts. **$270,000.**

Maryland—State Dpt. Health, 2411 N. Charles St., Baltimore, plans by B. der, 326 N. Charles St., Baltimore, ic disease hospital, **$900,000.** Site not ted.

., Baltimore—State, c/o Inspector of con, Charles and Conway Sts., plans by Hebrank, 20 E. Lexington St., tobacco house addns., alterations, Light and den Sts. **$50,000.**

s, Milton—Town Bd. Selectmen, Town plans by Leland & Larsen, 314 Statler , Boston, Mass., brick, steel hospital, ville Rd., Canton Ave., and Highland **$150,000.**

ch., Detroit—City, Receiving Hospital, mb and St. Antoine, 21220 Grand River, steel, rein.-con., stone alterations, to Receiving Hospital. **$195,500.**

n., Breckenridge—Bd. Educ., J. A. son, clk., sketches nearing completion W. Jackson, St. Cloud, 2 story, brick, school addn. **$150,000.**

linn., Mankato—Bd. Educ., Loretto M. Vogel, clk., plans by Pass & Rockey, Ekle , high school, **$1,100,000.** Jesse B. is Co., 416 Essex Bldg., Minneapolis, s. CD 11/17—ENR 11/25, under Public.

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POSTWAR PROJECTS (Cont'd.)

Minn., Zumbrota—City, Bd. Educ., G. G. Erridge, clk., authorized to buy site and construct school. **$150,000** (not official).

New York—Dpt. P. Wks., Municipal Bldg., New York, plans by F. P. Platt & Bro., 101 Park Ave., New York, Zone 17, garage addn. for Dist. 56 to house Dist. 68, Queens Co., for Dpt. Sanitation, 125 Worth St., New York. **$143,500.** CD 1/29/43—ENR 2/4/43.

N. Y., Beacon—Dpt. P. Wks., State Office Bldg., Albany, plans completed Proj. No. Cor-46, reconstructing kitchen, bakery, dining room and auditorium at Matteawan State Hospital, for Dpt. Correction, State Office Bldg., Albany, **$308,000.** Div. Construction, Div. Architecture, C. J. White, comr., State Office Bldg., Albany, engr. CD 1/7—ENR 1/27.

N. Y., Auburn—State Dpt. P. Wks., State Office Bldg., Albany, plans 10% completed, Proj. No. Cor.-40 new maintenance shop bldg. at Auburn Prison, for Dpt. Correction, State Office Bldg., Albany, **$250,000.** Div. Architecture, C. J. White, comr., State Office Bldg., Albany, engr. CD 12/31—ENR 1/13.

N. Y., Bedford Hills—Dpt. P. Wks., State Office Bldg., Albany, plans completed replacement boiler and power plant equip. at Bedford Hills-Westfield State Farms, Proj. No. Cor-41, for Dpt. Correction, State Office Bldg., Albany, **$158,000.** Div. architecture, C. J. White, comr., State Office Bldg., Albany, engr.

N. Y., Brooklyn—Dpt. P. Wks., Municipal Bldg., New York, Zone 7, plans underway by A. Raymond, 101 Park Ave., New York, Zone 17, garage for Dists. 47 and 48, for Dpt. Sanitation, 125 Worth St., New York. **$342,000.** CD 3/11—ENR 3/18.

★**N. Y., Brooklyn**—Dpt. P. Wks., Municipal Bldg., New York, Zone 7, plans underway by Syska & Hennessy, 144 E. 39 St., New York, laundry for city hospitals of Brooklyn Boro, for Dpt. Hospitals, 125 Worth St., New York, **$1,068,000.**

N. Y., Brooklyn—Dpt. P. Wks., Municipal Bldg., New York, Zone 7, plans underway garage for Dists. 39 and 49, for Dpt. Sanitation, 125 Worth St., New York. **$327,000.** Moran, Proctor, Freeman & Mueser, 420 Lexington Ave., New York, engrs. CD 2/4/43—ENR 2/11/43.

N. Y., Brooklyn—State Dpt. P. Wks., State Office Bldg., Albany, preliminary plans underway Proj. No. XMN-2, addn. to heating sys., 106th Armory, for Executive Dpt., Div. Military & Naval Affairs, **$85,000.** Div. Architecture, C. J. White, comr., State Office Bldg., Albany, engr.

N. Y., Buffalo—State Dpt. P. Wks., State Office Bldg., Albany, preliminary plans underway, Proj. No. XMN-1, replacement heating sys. at 174th Armory, for Executive Dpt., Div. Military & Naval Affairs, **$75,000.** Div. Architecture, C. J. White, comr., State Office Bldg., Albany, engr.

N. Y., Clifton—Dpt. P. Wks., Municipal Bldg., New York, plans by I. Fenichel, 724 5 Ave., New York, garage for Dist. 76, 77 and 78 and Sect. Station, Proj. S-50, for Dpt. Sanitation, 125 Worth St., New York, **$200,000.** CD 3/11/43—ENR 3/18/43.

N. Y., Coxsackie—Dpt. P. Wks., State Office Bldg., Albany, plans 10% completed Proj. No. Cor-23, constructing, altering for converting dormitories into cells at N.Y.S. Vocational Institute, for Dpt. Correction, State Office Bldg., Albany, **$180,000.** Div. Architecture, C. J. White, comr., State Office Bldg., Albany, engr.

N. Y., Elmira—Dpt. P. Wks., State Office Bldg., Albany, preliminary plans underway Proj. No. Cor-6, laundry, bath, shoe and tailor shop bldg., incl. service connections at Elmira Reformatory for Dpt. Correction, State Office Bldg., Albany, **$250,000.** Div. Construction, Div. Architecture, C. J. White, comr., State Office Bldg., Albany, engr. CD 3/15—ENR 3/23.

N. Y., Elmira—Dpt. P. Wks., State Office Bldg., Albany, plans completed Proj. No. Cor-42, constructing, equipping dining room and kitchen at Elmira Reformatory for Dpt. Correction, State Office Bldg., Albany, **$450,000.** Div. Architecture, C. J. White, comr., State Office Bldg., Albany, engr. CD 12/27—ENR 1/13.

N. Y., Grasslands (P. O. Elmsford)—Comrs. Westchester Co., White Plains, plans underway by Wm. C. Stohldreier & R. G. Zetsche, White Plains, maintenance bldg. **$55,000.**

N. Y., Ithaca—Dpt. P. Wks., State Office Bldg., Albany, plans completed Proj. No. H-3, remodeling power plant at Briggs Memorial Hospital, for Dpt. Health, State Office Bldg., Albany, **$120,000.** Div. Construction, Div. Architecture, C. J. White, comr., State Office Bldg., Albany, engr. CD 12/27—ENR 1/13.

N. Y., New York—Dpt. Parks, Arsenal Bldg., 64 St. and 5 Ave., Zone 21, plans underway reconstructing heating and ventilation sys. in N. Y. Public library, 5 Ave. and 42 St., for Dpt. Museum & Institutions, Dpt. Parks, Arsenal Bldg., 64 St. and 5 Ave., Zone 21. **$460,000.** CD 3/23—ENR 3/30.

★**N. Y., New York**—Dpt. P. Wks., Municipal Bldg., Zone 7, plans underway by Bloch & Hesse and Pomerance & Breines, 18 E. 41 St., replacements, reconstruction, incl. northeast and west wings, Central Steam, Power Plant expansion, storage facilities, at Harlem Hospital, for Dpt. Hospitals, 125 Worth St. **$3,100,000.** CD 3/11/43—ENR 3/18/43.

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